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MODERN METALS

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THE ALUMINUM HEARINGS

- **Hot Metal Deals Shrink Die Casters' Sales to Auto Makers**
  Kellers—American Die Casting Institute
- **Soaring Scrap Exports Threaten Smelters' Supply**
  Burton—Aluminum Smelters Research Institute
- **Controls on Aluminum Scrap Exports Not Needed**
  Mighdoll—National Association of Waste Material Dealers
- **Primary Producers Eyeing Secondary Smelters' Markets**
  Wakesberg—National Association of Waste Material Dealers
- **Price Squeeze Perils Independent Extruders**
  Starr—Aluminum Extruders Council

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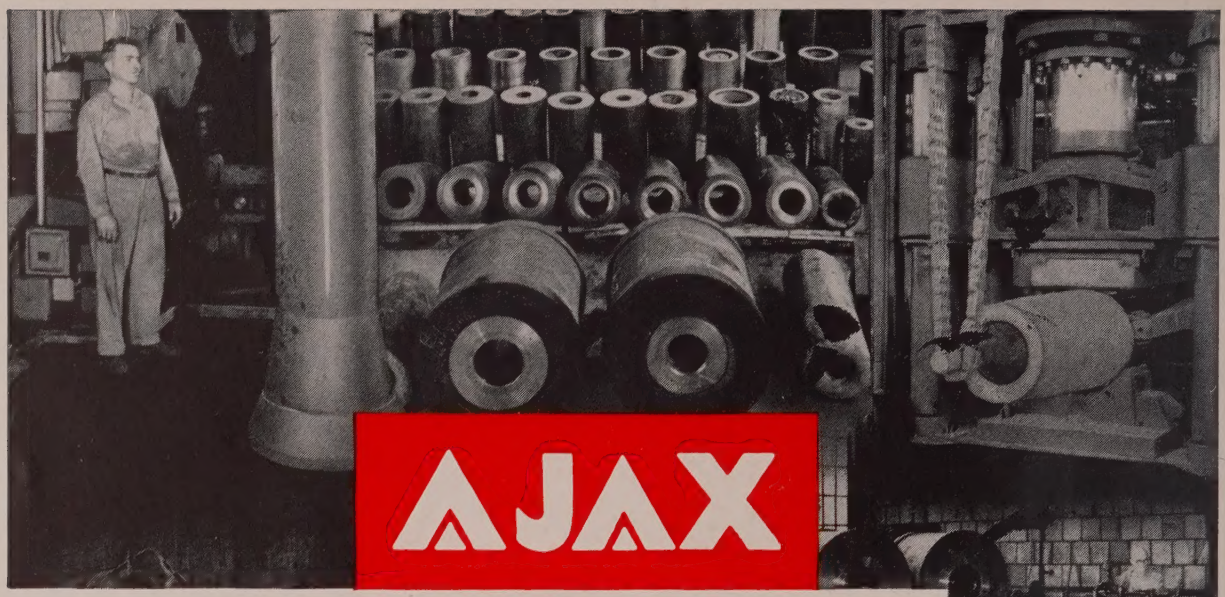

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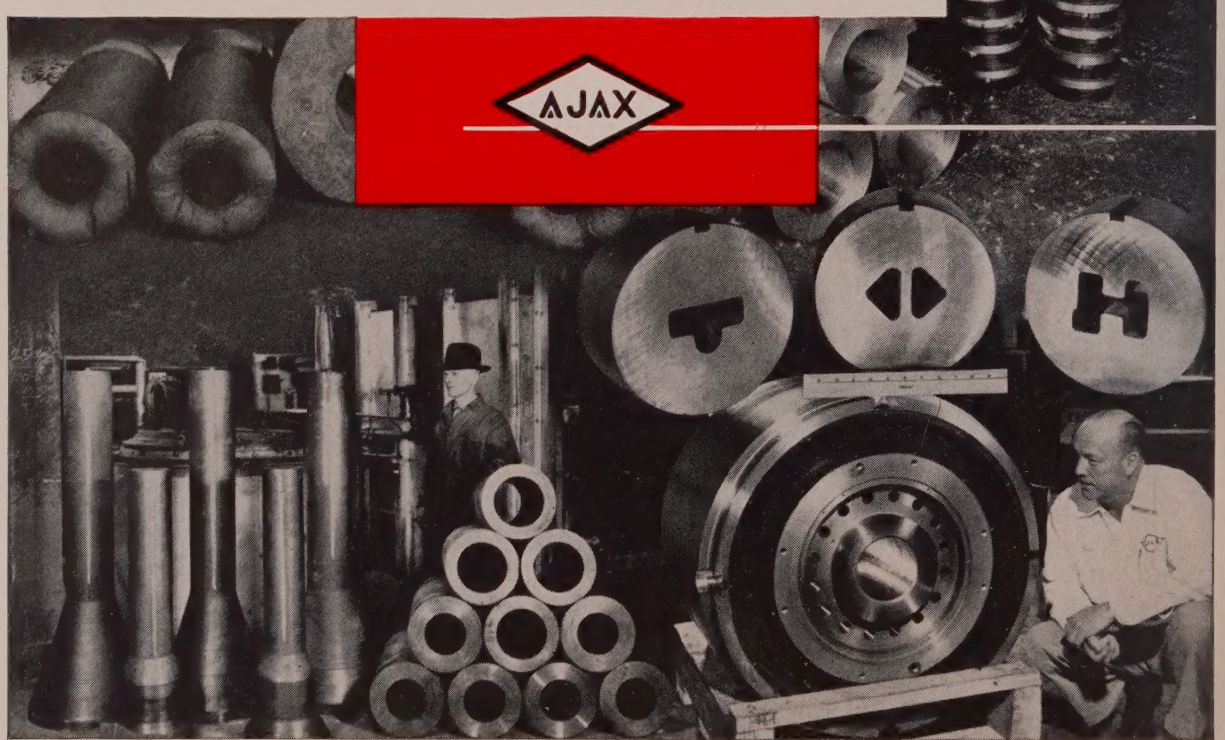

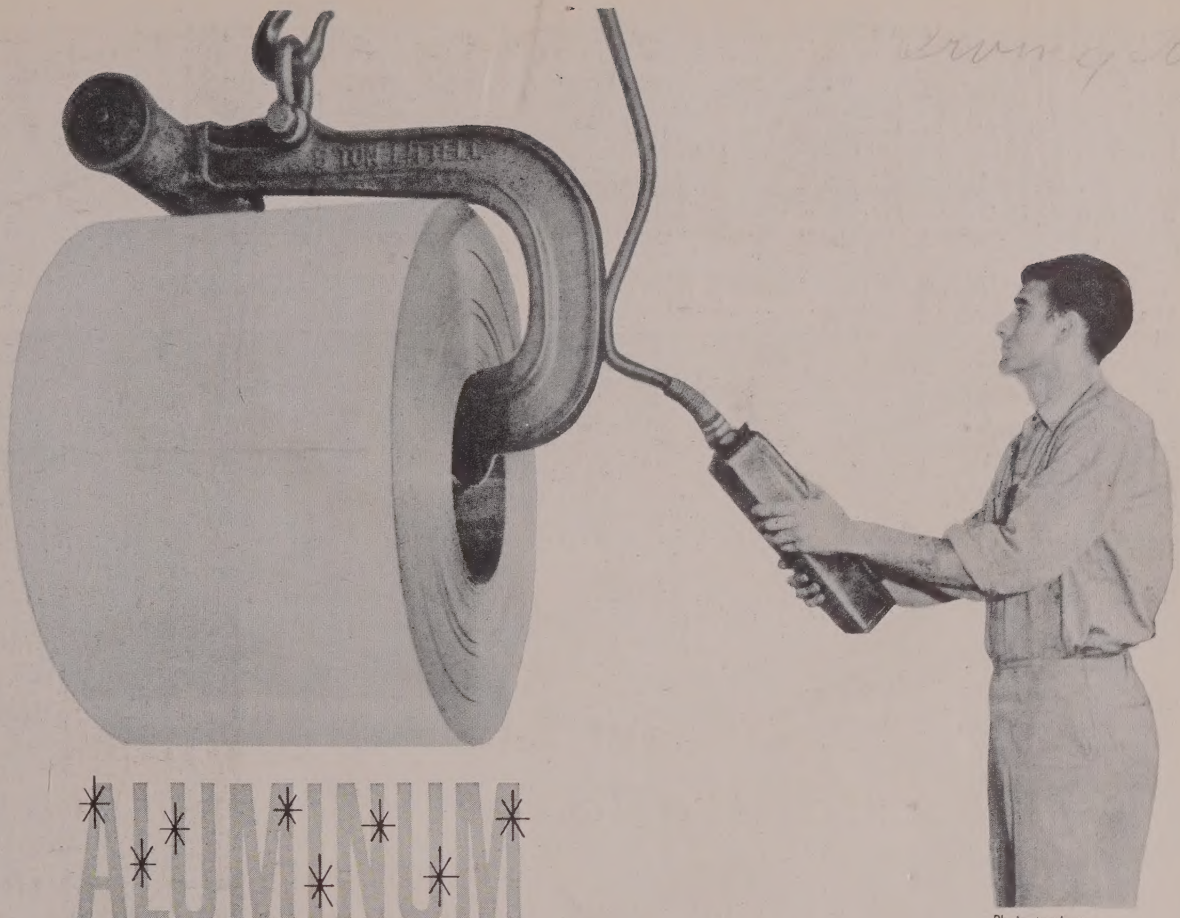

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LITHO-STRIP CORP.

ALUMINUM

Bonderized and painted coil...

a revolution in product quality and performance

Bare aluminum enters the finishing installation and is cleaned, Bonderized and roll coat painted in continuous automated operation. Re-coiled, it's ready for forming into any one of dozens of products.

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Aluminum, Bonderized and painted in the strip, is being used in huge tonnages today. Better investigate its economy and advantages for your production. Call in the Parker representative now!

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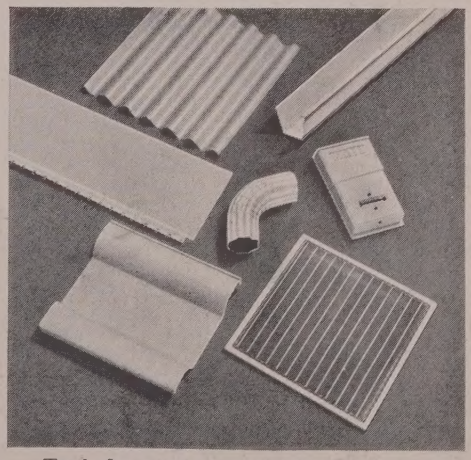

Typical products formed from aluminum, Bonderized and painted in the strip.

Parker Rust Proof Company
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BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

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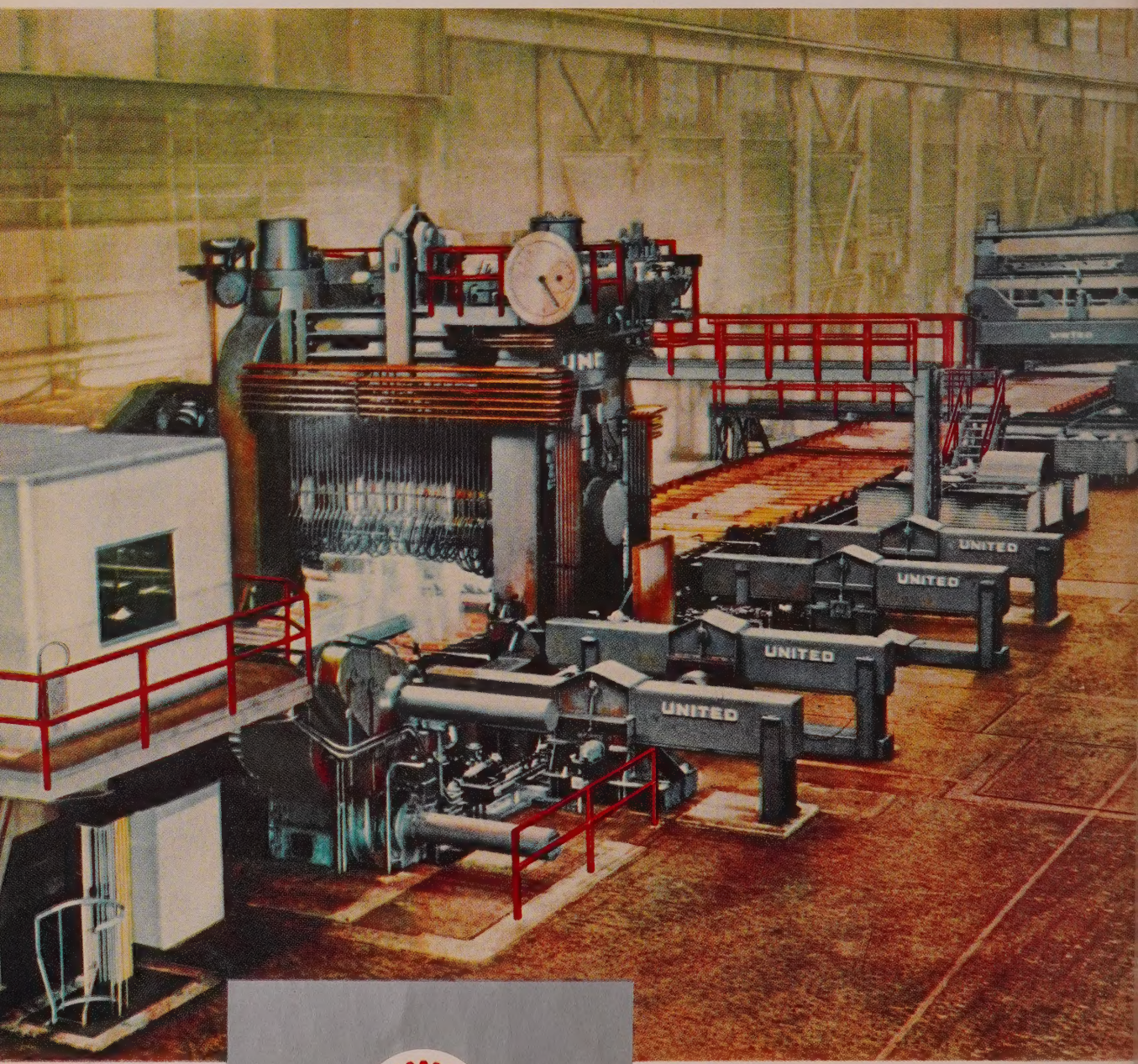
168" 4-HIGH REVERSING HOT MILL FOR ROLLING ALUMINUM



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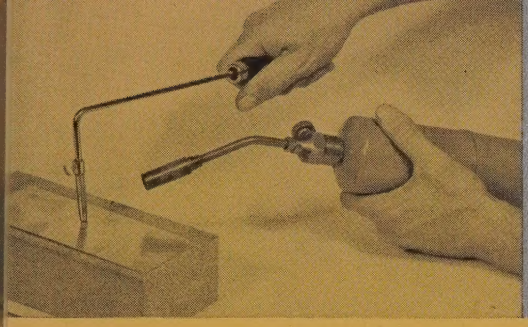
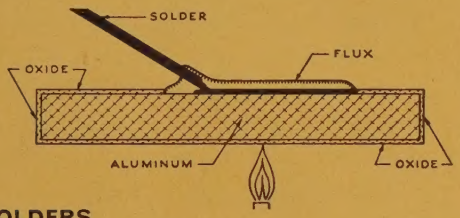


Here's how to solder aluminum quickly and efficiently:

Aluminum can be soldered by most of the common methods used with other metals—methods such as hot plate, dip, furnace, iron, and torch soldering. In addition, you can use some techniques that are more applicable to aluminum than to other common metals—friction soldering, glass fiber brush soldering, and ultrasonic soldering. The best method for you will depend on the size and shape of the parts, design of the joint, quantity, and the function of the finished assembly.



SOLDERS

Two types of solders are commonly used with aluminum. These are the reaction type, used with suitable fluxes, and the friction type, requiring an abrasive action for tinning instead of flux. Although the reaction type solders have been used more commonly, the recent development of the glass fiber brush technique should greatly increase the use of friction soldering. A major advantage of the friction solders is that they eliminate the chance of corrosion present when fluxes are not completely removed from soldered joints. Below is a description of the most important aluminum soldering methods of both types:

METHODS OF SOLDERING ALUMINUM

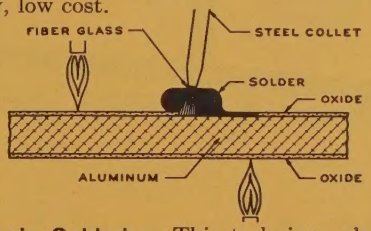
Hot Plate Soldering. A hot plate heated by gas or electricity is sometimes used for soldering small flat aluminum parts. The aluminum parts are assembled and laid on the hot plate, and brought to soldering temperature. The soldering is then done while the parts remain on the hot plate. When the joint is completed, the parts are removed and cooled. Hot plate soldering is generally restricted to flat parts to assure even heat for effective soldering.

Dip Soldering. Dip, plunge or pot soldering is a very convenient way to solder several aluminum parts at a time. A crucible made of graphite or cast iron and heated by electricity or gas is kept filled with a molten reaction type solder. The temperature is held at about 100° to 200° above the melting point of the solder. Dip soldering is most effective in soldering lugs, clips and clamps on wire ends.

Furnace Soldering. This method permits easy soldering in an air atmosphere, and is used for simultaneous or continuous soldering of large numbers of parts. Either gas-fired or electrically heated furnaces are used. The parts are first jigged with the solder in position—either at a preplaced filler alloy or a coating on the components—then fluxed. A chain link or wire mesh conveyor carries the parts through the processing furnace which has three heat zones: preheating, soldering and slow cooling.

Friction Soldering. For many years this was the only sure way to solder aluminum alloys. Any low melting point solder will bond to aluminum if friction is applied to a hot aluminum surface covered with a pool of molten solder. The abrasion will remove the aluminum oxide film from the surface and permit direct contact of the molten solder with the bare aluminum.

Glass Fiber Brush Soldering. This technique, the latest variation of the friction method, is also the newest method with great potential. A glass fiber brush is used as an abrading tool to remove the oxide coating through a layer of molten solder. Its suitability to high production industrial equipment promises to greatly increase the application of aluminum in assemblies that require high quality, low cost.



Ultrasonic Soldering. This technique also eliminates the use of fluxes. In this method, the oxide film is removed from the surface by a high frequency vibration. When the ultrasonic wave is submerged in molten solder, cavitation effects remove oxides from aluminum objects immersed in solder. A frequency of 20 kc is not noticed by humans, but effectively causes active cavitation. Special ultrasonically vibrated soldering irons and soldering pots have been developed to solder aluminum sheet, castings and mill products.

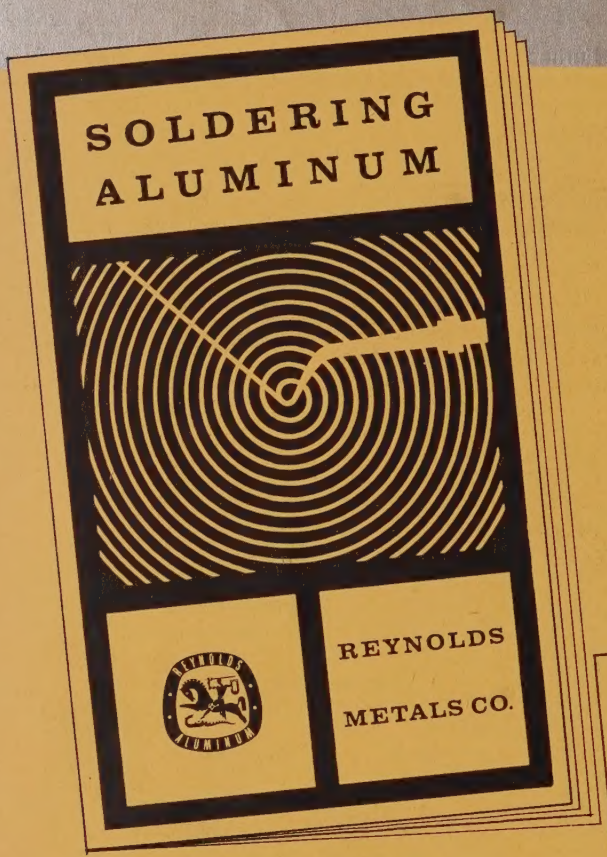
A complete handbook with illustrations and tables discussing the various methods of soldering aluminum is offered on the following page. For more information and service, contact Reynolds Metals Company, P.O. Box 2346-GM, Richmond 18, Va.

And to be sure you get the right aluminum —use Reynolds Aluminum

FREE booklet—"Soldering Aluminum"—see next page ——→

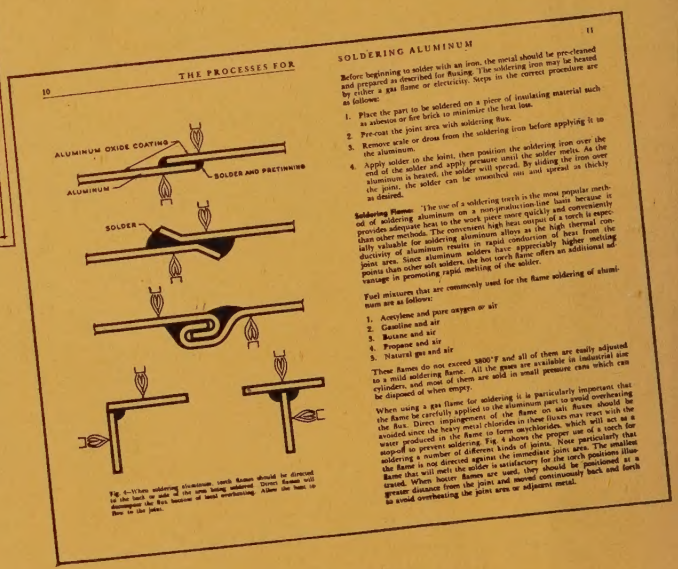
How to Solder Aluminum Simply and Quickly

. . . a guide to industrial aluminum soldering



Send for this new, free Reynolds handbook on soldering aluminum

It discusses the various soldering methods employed with aluminum, when to use each method, and equipment used with each. Both production and "hobby shop" methods are described. A *must* for the man interested in aluminum assembly and joining.



10 THE PROCESSES FOR

ALUMINUM OXIDE COATING
SOLDER AND PRETINNING
ALUMINUM
SOLDER

Fig. 4—When soldering aluminum, torch flames should be directed to the back or side of the area being soldered. Direct flames will decompose the flux because of heat overheating. Allow the heat to flow to the joint.

SOLDERING ALUMINUM 11

Before beginning to solder with an iron, the metal should be pre-cleaned and prepared as described for fluxing. The soldering iron may be heated by either a gas flame or electricity. Steps in the correct procedure are as follows:

1. Place the part to be soldered on a piece of insulating material such as asbestos or fire brick to minimize the heat loss.
2. Pre-coat the joint area with soldering flux.
3. Remove scale or dross from the soldering iron before applying it to the aluminum.
4. Apply solder to the joint, then position the soldering iron over the end of the solder and apply pressure until the solder melts. As the aluminum is heated, the solder will spread. By sliding the iron over the joint, the solder can be smoothed out and spread as thickly as desired.

Soldering Flames. The use of a soldering torch is the most popular method of soldering aluminum on a non-production-line basis because it provides adequate heat to the work piece more quickly and conveniently than other methods. The convenient high heat output of a torch is especially valuable for soldering aluminum alloys as the high thermal conductivity of aluminum results in rapid conduction of heat from the joint area. Since aluminum solders have appreciably higher melting points than other soft solders, the hot torch flame offers an additional advantage in promoting rapid melting of the solder.

Fuel mixtures that are commonly used for the flame soldering of aluminum are as follows:

1. Acetylene and pure oxygen or air
2. Gasoline and air
3. Butane and air
4. Propane and air
5. Natural gas and air

These flames do not exceed 3800°F and all of them are easily adjusted to a mild soldering flame. All the gases are available in industrial size cylinders, and most of them are sold in small pressure cans which can be disposed of when empty.

When using a gas flame for soldering it is particularly important that the flame be carefully applied to the aluminum part to avoid overheating the flux. Direct impingement of the flame on salt fluxes should be avoided since the heavy metal chlorides in these fluxes may react with the water produced in the flame to form oxychlorides, which will act as a stop-off to prevent soldering. Fig. 4 shows the proper use of a torch for soldering a number of different kinds of joints. Note particularly that the flame is not directed against the immediate joint area. The smallest flame that will melt the solder is satisfactory for the torch positions illustrated. When heavier flames are used, they should be positioned at a greater distance from the joint and moved continuously back and forth to avoid overheating the joint area or adjacent metal.

WRITE for two other Reynolds handbooks on aluminum joining—"Brazing Aluminum" and "Different—Not Difficult." Both are valuable sources of information to round out your aluminum joining know-how.

Reynolds Metals Company
P.O. Box 2346-GM, Richmond 18, Virginia

Send me the Reynolds handbook I have checked below:

☐ Soldering Aluminum ☐ Brazing Aluminum
☐ Different—Not Difficult

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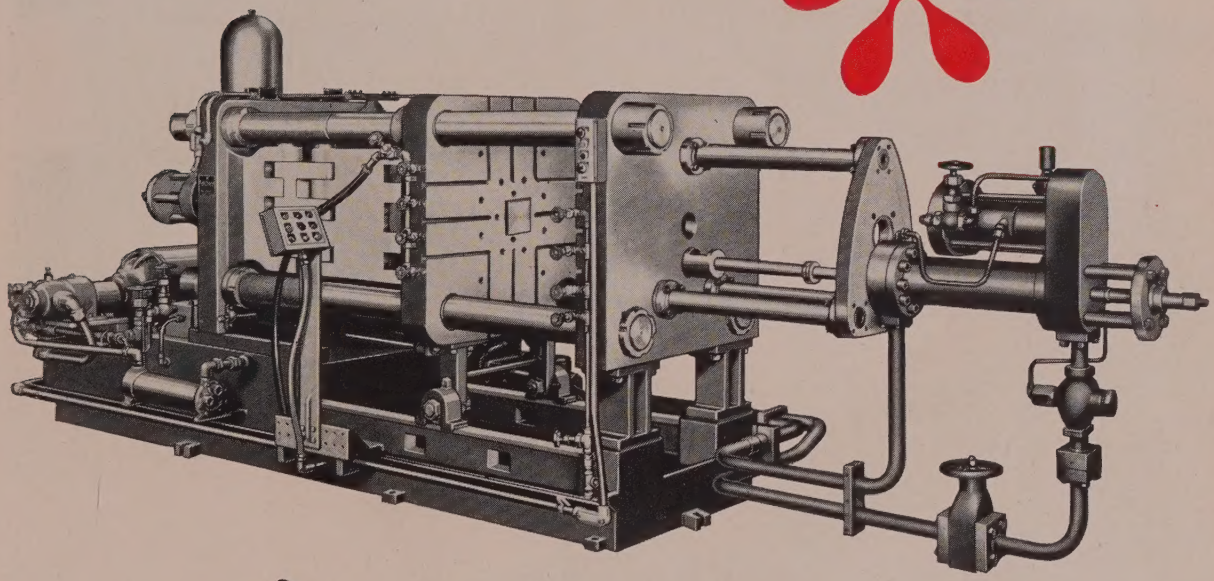

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Die Thickness	Min. Max.	8 36
Die Stroke	Min. Max.	9 15
Locking Pressure (tons)		500
Injection Cyl. Diameter		4⅝
Injection Cyl. Stroke (Adj.)		14 to 19½
Shot Position		on center and 6" below center

(All dimensions in inches)

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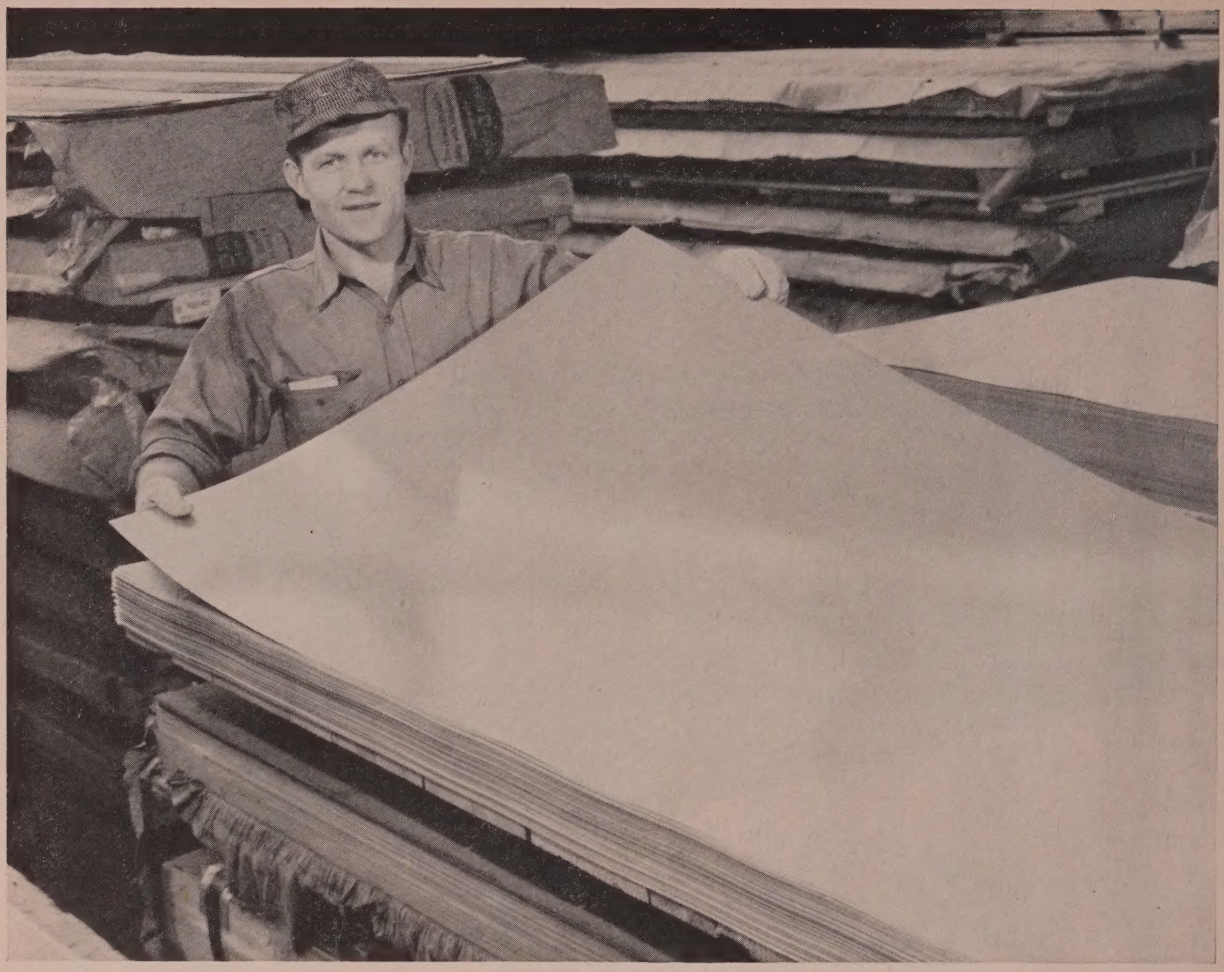

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MODERN METALS
Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

ON THE COVER: It was "aluminum hearings" time again when the Yates Committee opened up shop early last month and gave some 15 witnesses a chance to air their pet peeves and/or reply to somebody else's charges. As in the past, we obtained a transcript of the fiasco and are boiling it down to manageable length in the 2-part (or 3-part) report starting on page 32 of this issue. Most of the testimony in Part 1 is of the "pet peeve" variety. Next month, we'll have a few more gripes, plus the rebuttals of government officials and aluminum producers.

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Modern Metals is published monthly by Modern Metals Publishing Co., not incorporated, at Barrington, Ill. Printed in U.S.A. Subscription in the United States: To fabricators and users of light metals—$3.00 one year; $5.00 two years; $6.00 three years. To all others in U.S.—$10.00 per year. Foreign $9.00 one year; $15.00 two years; $21.00 three years. Back issues: $1.00 each.

Modern Metals has by far the world's largest circulation among light metals fabricators, foundries and product manufacturers who use aluminum, magnesium, and titanium. Circulation: Now over 15,500 copies per month. Acceptance under controlled circulation at Barrington, Ill.

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Modern Metals

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BOX 110
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Letters

How To Work Wrought Magnesium

Sirs:

I am interested in obtaining basic or background information on forming and fabricating magnesium.

We are interested to know whether reprints on the subject might be available. Also, could you advise as to possible sources of this information. In your Buyer's Guide we note your listing of Brooks & Perkins, Inc., and Dow Metal Products Co., whom we will contact. Are there any other sources?

We are interested in the characteristics of the metal and forming sheets or plates, plus fabricating assemblies by low temperature solder, brazing and welding.

"F"—Wis.

MM—We have sent you several reprints on the subject. Both Brooks & Perkins and Dow will undoubtedly fill you in on additional technical data.

Also, see our next several issues for some papers on the subject that were given last month at a joint meeting in England. In fact, one of the papers—on finishing magnesium—appeared in our May issue.

Wants to Anodize Windows and Doors

Sirs:

For our aluminum window and door production we are looking for an aluminum hard-coating or anodizing process which we would like to install in our plant.

We are looking for a reliable supplier and in this connection would appreciate it very much if you would forward us a copy of your booklet, "How to Clean and Finish Aluminum."

Kindly send the invoice direct to us.

"W"—Alberta, Canada

MM—A copy of our "Finishing Aluminum" reprint has been sent. We started out with more than 1500 copies seven months ago; have only a couple hundred left. So if you've been putting off ordering your copy, better hurry. Just a buck apiece for up to 25 copies; 50 cents each for over 25.

Boat Business Becalmed?

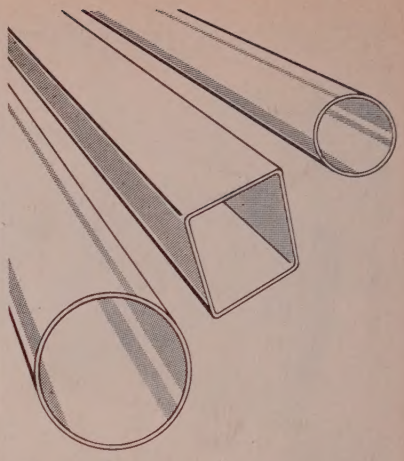
Sirs:

Somehow I can't resist passing on the comment that occurred to me when I read your editorial "Boat Business Becalmed" (April, p. 60). You suggest that boat builders et al. "needle the proper authorities."

Why in the world does everyone, whenever they get in any kind of a bind, immediately expect some governmental agency or other to bail them out? Why don't the boat builders et al. get together, buy some lakefront property, build some facilities, and rent them out? If there are 5000 loose applicants, they should do real well.

"K"—Boston

MM—Good idea. Trouble is, the Chicago Park District controls virtually the entire lakefront of the largest city on the Great Lakes; is forbidden by law to sell any part of it. This is all to the good because private entrepreneurs could quickly convert the city's greatest natural asset into a floating honky-tonk. But the Park District apparently leases lakefront property to private organizations, presumably of the



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Without obligating me in any way--please send me a copy of the new Castle Aluminum Stock & Price Catalogue.

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non-profit variety. The Lincoln Park Gun Club is an example. Maybe something of the same sort could be done to accommodate the city's thousands of frustrated boating enthusiasts.

New Way to Make Screw Machine Stock

Sirs:

Would you please send two copies of the reprint, "New Way to Make Aluminum Screw Machine Stock." This article appeared in the March 1960 issue of MODERN METALS.

If there is any charge for these reprints, please bill us.

"W"—Pa.

MM—Reprints have been sent. Additional copies are still available. The article describes not only a new cold extrusion process for producing aluminum screw machine stock, but also an ingenious machine for continuous casting aluminum extrusion billets.

Wanna Know About Super-Pure Aluminum?

Sirs:

I would like very much to have two copies of an article which appeared in the April 1960 issue of MODERN METALS. The title is: "WITH SUPER PURE ALUMINUM . . . " If there is a charge, please send invoice.

"M"—Ind.

MM—Reprints sent. Interest in super-purity aluminum is gaining momentum as more and more users discover what this material can do for their products. That's the purpose of this article, which details the properties, characteristics and advantages of super-purity aluminum. Interested? We still have a few reprints left.

Who Fabricates Magnesium?

Sirs:

We are writing to find out if you are able to supply us with a list of magnesium fabricators who could make some covers of magnesium checkered plate and angles. If you do not have such a list, is it possible for you to direct us to the right source?

"M"—Chicago

MM—We assume you are referring to magnesium treadplate. For the type of work you have in mind, we suggest you contact Dow Metal Products Co., Midland, Mich., and/or Brooks & Perkins, Inc., 1954 W. Fort St., Detroit 16.

On Welding Aluminum . . .

Sirs:

We were interested in seeing, in your May issue, Part I of what you call a series on welding aluminum. From what you say, it sounds like an authoritative treatment of a subject that is often controversial. . .

Are reprints to be made available?

"B"—New York

MM—As you will note in this issue (page 50), Part 2 gives the "nuts and bolts" details on TIG welding. It now appears that the entire series will be spread over the next seven or eight issues; will probably fill 40 pages or more.

Yes, the whole shebang will be reprinted; will make a whale of a manual on welding aluminum.

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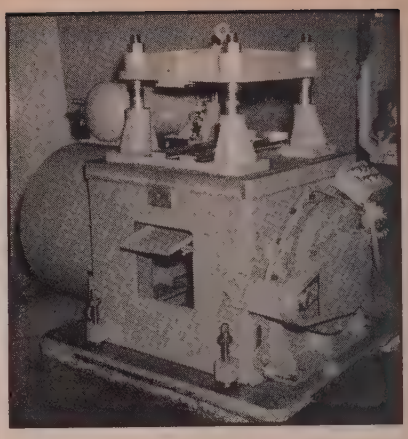

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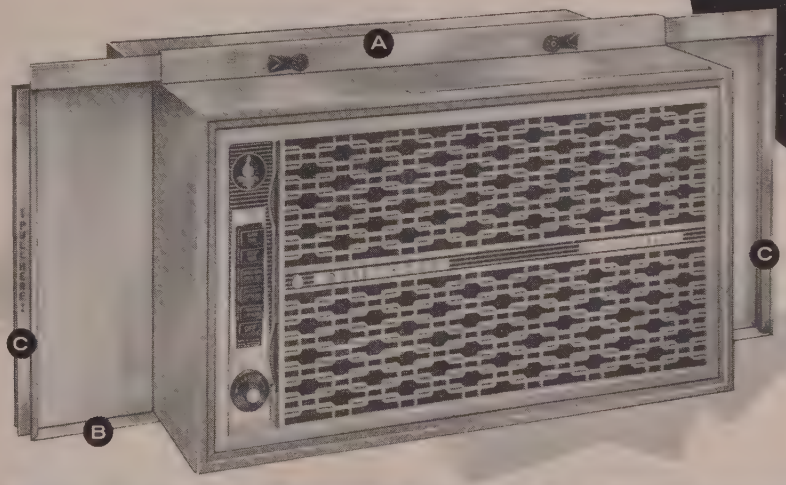
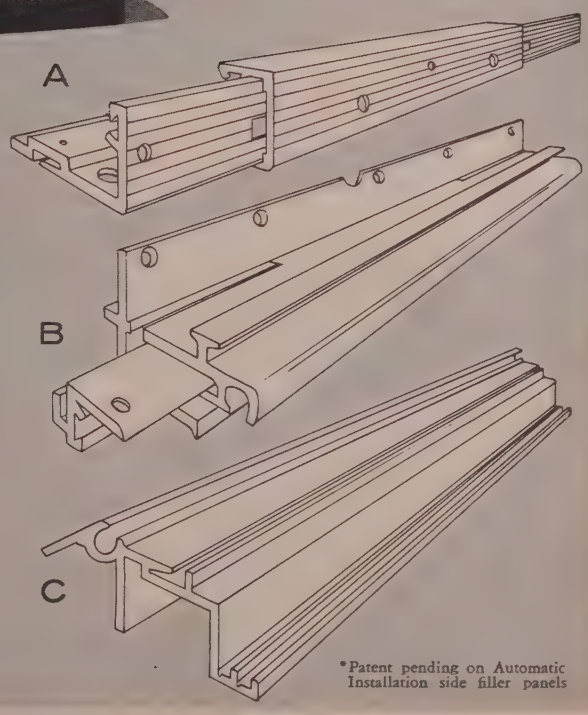


In Quiet Kool's KOOL-MOUNT* AIR CONDITIONERS by EMERSON RADIO

The hit of the new room air conditioning season is the new QUIET KOOL by Emerson Radio — the first air conditioner designed for true instant installation. BUILT-IN sliding aluminum filler panels permit the unit to be put in operation almost as soon as it is placed on a window sill. The free-sliding frames for these Kool-Mount* panels are aluminum extrusions by GENERAL EXTRUSIONS, INC.

The G.E.I. sections not only slide freely and fit tightly, but they also enhance the beauty of this versatile air conditioner. What's more, this manufacturer's requirements for durability and economy have been met by G.E.I.'s uniform quality and complete conformance to critical specifications.

Once again G.E.I. has pioneered a new application for extruded aluminum. If you have a problem which might be solved by G.E.I.'s specialists in design and production, why not take it to a G.E.I. representative? G.E.I. guarantees speedy and high quality anodizing and fabrication and can give you complete and unsurpassed service in all phases of aluminum processing.



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*Patent pending on Automatic Installation side filler panels

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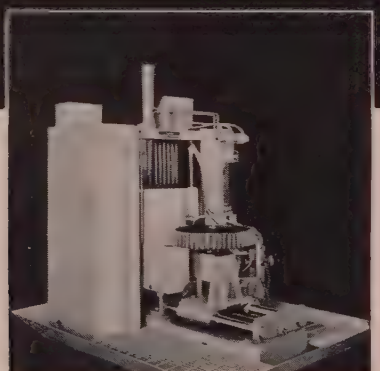
Ajax Magnethermic Representatives are located in major market areas. You will find the telephone number of the office in your area on the opposite page. Whether you want information on an application, or service on an existing installation, the Ajax Magnethermic man can give you assistance. He knows induction heating and melting.



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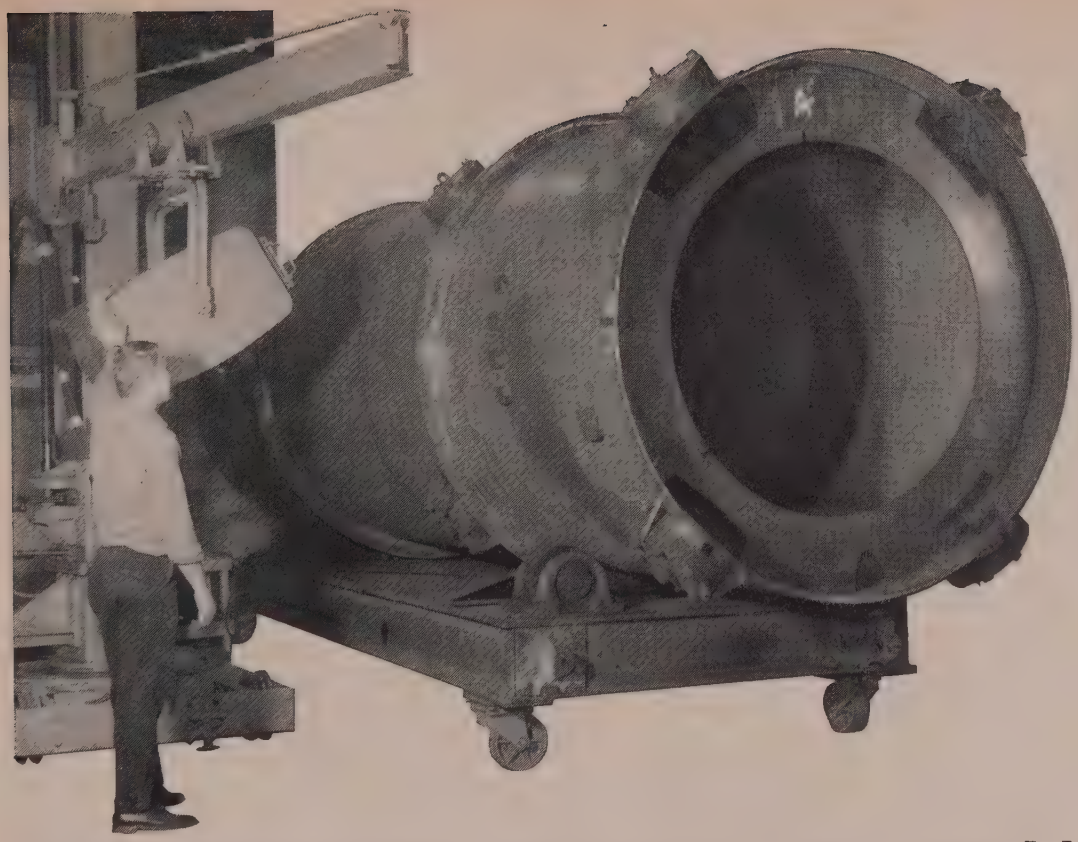
Here and There

The Scrap Over Scrap » » Two trade groups and one government department have drummed up a lively skirmish over exports of aluminum scrap. The opening salvo was fired by Carl Burton when he told the Yates Committee that export limitations were needed because "grossly increased" exports of aluminum scrap would aggravate the problems of the secondary smelters. (For details, see the report starting on page 32.) A few minutes later, M. J. Mighdoll of the National Association of Waste Material Dealers asserted that export controls were not needed; that shipments overseas helped keep scrap from becoming a captive market, subject to control by the smelters. Next day, a Commerce Department spokesman told the committee that controls were unnecessary; that producers' runaround scrap accounted for a "significant portion" of the greatly increased scrap exports in the first quarter of 1960; and that little of this material would go to smelters if it were not shipped out of the country.

Exports Still Climbing » » But Carl Burton was undaunted. On May 31st he released a statement noting that scrap exports in March were 37% higher than the 11 million pound per month average reported to the Yates Committee by the Commerce Department, and charging that "it is very apparent that the Department had not been provided with the facts." Burton observed that at the rate established so far this year, exports can "and very well may, amount to more than 150 million pounds" — 15% or more of total expected supply. This, he contended, further supports the smelters' plea for limitations on exports of aluminum scrap. But a few days later, the scrap dealers' association again took issue with Burton, claiming that he had failed to note that "there has been a sharp decline in the purchase of aluminum scrap by domestic smelters"; and that "since the beginning of the year smelters have reduced buying prices for aluminum scrap by 2c a pound." That's where the matter stands as of this writing. It's obvious that the disputants cannot resolve their differences; they're quarreling over different things. It's also obvious that we haven't heard the last of this running battle.

Easier MIG Welding » » Already widely used for speedy joining of aluminum, MIG welding should find even greater application because of two electrode refinements. Faster deposition and less penetration without increased spatter will result from extending the welding wire as much as 5 inches from contact point to arc, according to McKay Co., York, Pa. It also says weld metal can be dropped 50% faster for a given current when using CO_2 shielded welding. And since penetration can be decreased the extended electrode can be used for joining thin materials and for surfacing. The extended electrode improves MIG welding because current travels along the wire, pre-heating it before it is fed into the arc. Page Wire & Steel Div'n has flattened the electrode to obtain more directional versatility. Width-to-thickness ratio is about 3:1. By placing the



Undersea nest for a talented metal bird

This is the firing tube of the Navy's Polaris missile, made by Consolidated Welding and Engineering Company, Chicago, Ill. Every weld must be flawless. To make sure, more than 100 radiographs are made on each assembly.

Made of HY-80 plate with monel inserts, this firing tube presents difficult problems in welding dissimilar metals. But radiography, with Kodak Industrial X-ray Film, Type AA, checks the entire assembly for discontinuities.

Radiography provides the means of "seeing" internal conditions and supplies a lasting record of what is seen. It gives producers of welded products and of castings a means of making sure only high-quality work is delivered.

Would you like to know how radiography can help you? See an x-ray dealer or write us to have a Kodak Technical Representative call.

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- Speeds up radiographic examinations.
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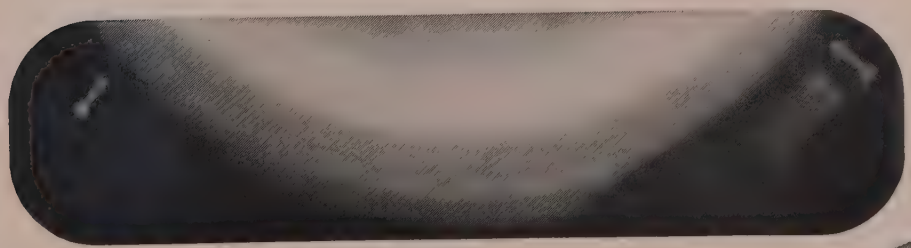

Radiograph of weld on missile firing tube.

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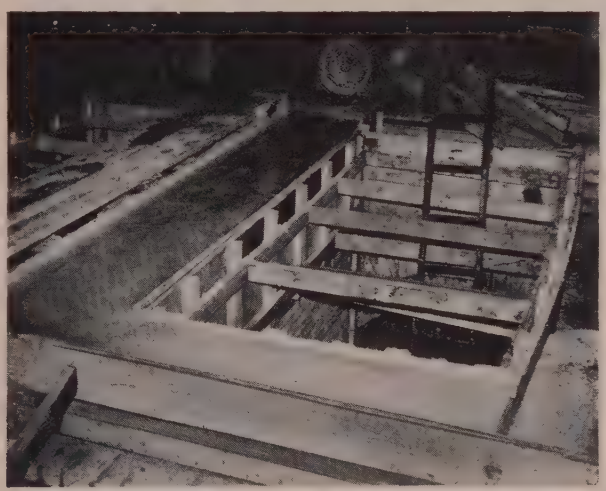
long axis of the electrode parallel to weld direction a narrow bead with deep penetration is produced. When used at a full right angle to this position a wide, flat bead is dropped. And by using wire at various angles between these two positions, different combinations of bead width and penetration are obtained. (Next month MIG welding will be featured in our "Welding Aluminum" series. TIG welding is covered in the article starting on page 50 of this issue.)

Ten Years With Maggie » » Magnesium has been a distributor metal about ten and a half years. It was back in December 1949 that the first magnesium distributor—Reliance Steel Co., Los Angeles—received its first shipment of magnesium from Dow. Since then the company has changed its name to Reliance Steel & Aluminum, has set up a separate division—Reliance Magnesium Co.—to handle mag sales, and has peddled about 6 million pounds of magnesium mill products. The mag sales curve slanted slightly upward at Reliance until around mid-1955, when West Coast aircraft plants suddenly discovered the merits of magnesium tooling plate. Volume tripled in about a year's time at Reliance, but the cutback in aircraft production started in the spring of 1957 and tooling plate sales hit the skids. Other products—notably, sheet and plate—helped take up the slack, and Reliance has managed to hold its mag sales curve at a fairly constant level these past three years. According to Bill Gimbel, president of Reliance Magnesium Co., the company's principal customers are in the aircraft, missile and materials handling industries. "We have a number of commercial and semi-military applications that should go to magnesium in the very near future," he reports. "And Dow has developed sheet and bar alloys that are closely competitive, pricewise, with other metals in many uses. Electronic subassemblies are full of possible conversions to magnesium." Gimbel sees space exploration creating a sizeable demand for magnesium in the next ten years. "Stiffness and weight are top structural considerations in space vehicle design," he explains, "and magnesium is far ahead of other commercial metals in these properties. Vehicles presently in space—the Midas and Discoverer satellites, for example—are 80-90% magnesium. Space vehicles weighing 50,000 pounds are now in the design stage," Gimbel adds, "and magnesium is the principal structural material. It's interesting to note that the lack of oxygen in space eliminates two of the main objections to magnesium — corrosion and the so-called fire hazard."

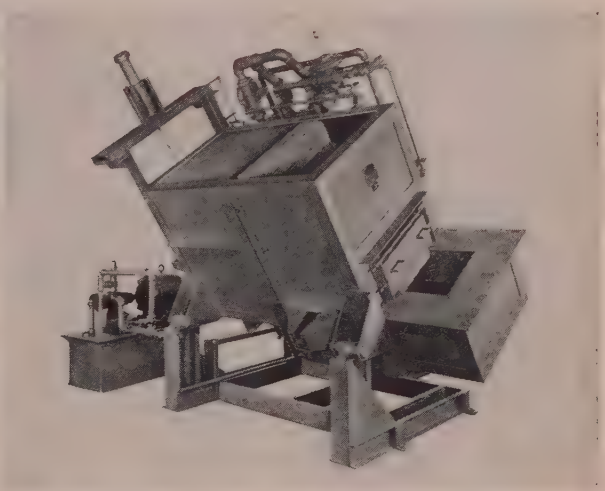
Supersonic Aluminum Transport » » Boeing Airplane Co. is urging the government to help private industry finance development of supersonic transport planes. And the speedy airliners of tomorrow may well be of aluminum. The firm estimates $50 million as the cost of a basic experimental aluminum craft to fly at a speed faster than sound. A steel prototype, though able to fly faster, would cost about $100 million. Boeing says quantity production would produce the same cost difference. In its efforts to spur the government to action the company called attention to rumors saying that Russia is building a supersonic aluminum transport.

In this stress-relieving furnace, B&W Kaocrete-D is used on the floor ledges, car top, in the door jamb and at the end of the flat roof where it withstands the abrasion of the door. This material is specially designed to withstand severe abrasive conditions and mechanical abuse.

Heavy duty car top service requires a high strength castable. B&W Kaocrete-D is excellently suited for this service at temperatures to 2500 F. B&W Kaocrete-32 is recommended for service above this range.



B&W Kaocrete-32 has been cast to form the curb walls of a soaking pit. When mechanical abuse from ingots damages the curb, Kaocrete-32 has the necessary properties to localize the damage, thus maintaining the serviceability of the rest of the curb.



The castable lining of this aluminum reverberatory furnace must have unusually high strength to withstand the considerable physical abuse of charging, operating and cleaning, while resisting the penetration of the molten metal. Kaocrete-D is widely used in this application.

How B&W refractory castables solve abrasion problems

Refractory castable linings used in metal-working furnaces are often subjected to severe mechanical abuse. Scraping by hand tools, loading and unloading, and the action of the molten metal and particle-laden gases all affect the life of refractories. Among B&W's line of refractory castables are two that are particularly suited to withstand unusual abrasive conditions. They are B&W Kaocrete-D and B&W Kaocrete-32, both of which have been used successfully in many demanding applications.

B&W Bulletin R-35A gives additional information on versatile B&W refractory castables. Write for copy to The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N.Y.

R606R

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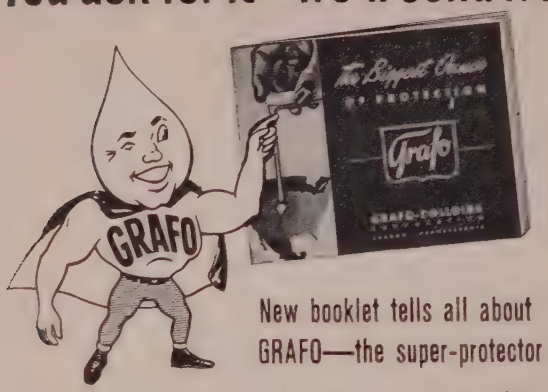

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President

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New Enterprise

Lightweight aluminum cables developed for the Navy will help keep the oceans free from magnetic mines. Several types of aluminum sweeper cables now being used or tested by the Navy are products of Kaiser Aluminum's Bristol, R. I., wire and cable works. The insulated cables, with attached external floats, are towed astern of minesweepers. Charged with electric current to set up a magnetic field, the cable explodes mines harmlessly underwater. Kaiser has also developed a three-conductor externally floated aluminum power cable for use in acoustic minesweeping.

A unique aluminum sidewall construction developed for **mobile homes** by Vagabond Coach Mfg. Co., New Hudson, Mich., has sparked company sales in the past year. The system, called Verti-Vent, has built-in ventilation, and provision for expansion and contraction of panels. Aluminum sheet exterior has rib corrugations on 6-inch centers; is painted on both sides with weather-resistant enamel, and backed with insulation.

A 130,000-square-foot plant in Dover, N. J., has been purchased by Mayer-Pollock Steel Co., Pottstown, Pa., from Eagle-Picher Co. William Pollock, president of the steel company, says aluminum **storm doors and windows** will continue to be manufactured in Dover. The plant will house Eagle Aluminum Products Co., Division of Mayer-Pollock Steel Corp.

Permaseal Mfg. Corp., Middlesex, N. J., an aluminum fabricator, has begun producing and marketing a new line of **aluminum awning windows** which includes two series: Lok-O-Matic 500 windows, designed for northern climates; and Series 600 with integral fin for new home application. Latches and flanged bushings are of nylon to prevent metal-to-metal contact of moving parts. Vents can be removed for reglazing and are tightly sealed with aluminum-colored vinyl weather stripping. Windows are offered in a variety of 80 standard sizes, all of which can be washed from the inside.

An aluminum door assembly table which is said to speed production and slash rejects has been developed by the Aluminum Tool & Engineering Division, Route 113, West, Bellevue, Ohio. Good fits and perfectly mitered joints are accomplished consistently, claims the firm. According to the company, the table allows all four door corners to be clamped and tightened simultaneously; it allows all corners to be held square; it allows fabrication of doors from 27 to 38 inches wide by 76 to 85 inches long without altering the setup; and an entire door frame assembly can be done in one setup. A hand-cranked model is offered at $336, and an air-operated model at $550.

Another anodizing firm — this one on Victory Ave. in South San Francisco — has started operations and thus joins the fast-growing list of aluminum finishing firms

Alcoa puts the metal where you want it

How BIG an impact have you seen lately? Alcoa can now make them up to 12 in. in diameter and 60 in. long.

When Alcoa's new 2,500-ton press hits an aluminum alloy slug, a giant impact is formed with the combined strength of an extrusion and forging.

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Alcoa Impacts are unfailingly sound. They have smooth, corrosion-resistant surfaces. You can have them in plain or complex shapes with design features combining those of forgings and extrusions—flanges, steps, multiple walls, bosses, ribs.

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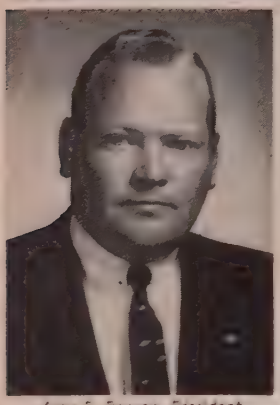

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across the country. The California Anodizing Co. will specialize in finishing products used in missiles, aircraft, electronic components and building. The $250,000 plant has eleven 26-foot tanks used for chemical conversion coating, color anodizing and clear alumilite ing. Arthur Loube is president; Harry Liss, vice president; Fred Lachman, secretary; Max Galant, treasurer, and Russell Young, general manager.

An innovation in **fishing rods** uses a special aluminum alloy to provide additional strength and improved tip control. It was developed by South Bend Tackle Co., Inc., 6710 N. Lincoln Ave., Chicago 45. The rod, part of the firm's Powerflex line, employs Alcoa aluminum tubing for the butt section, and fiberglass for the rod's remaining two sections. The semi-flexible butt and tip assure easy handling of light or heavy lures with each of the eight models in the line, says the firm.

Aluminium Limited proposes to expand its **fabricating facilities in Colombia** in partnership with Industrias Metalurgicas Unidas S. A., and other local capital. Aluminium will expand the extrusion plant of Perfiles de Aluminio y Cobre Ltda. by adding a 1250-ton press. Another project includes the formation of a new company, Alcan de Colombia, S. A., which will build a sheet rolling mill in Cali. This firm will be owned jointly by Aluminium and local capital. Work on both projects is to start immediately.

The newly formed Bonmar Metal Products Corp., Jerome Ave., Lyndhurst, N. J., was to have begun its aluminum and steel **continuous coating processing** operations last month. Harold Friedman, president of the new firm, says it will use its exclusive Colorite process to apply special finishes to metal of various widths and gauges. The firm is also equipped to offer plastic-on-metal processing, including vinyl-metal laminates, pre-coated wood grain and printed reproducible patterns for custom finishing.

A 6-inch center distance **worm gearmotor**—claimed to be the largest yet developed and housed with aluminum—is the latest addition to the line of Electra Motors Inc., 1110 N. Lemon St., Anaheim, Calif. The worm gearmotor comes in 3, 5, 7½ and 10 h.p. units that can be foot, ring or shaft mounted.

Saratoga Course, Saratoga Springs, N. Y., the oldest race track in America, has been rimmed with **aluminum railings** to help safeguard jockey and horse. Last year, when a new racing surface was installed, the New York Racing Association decided to replace the inside wooden rail which circles the mile-and-an-eighth track. Strong aluminum railing was chosen because it will not shatter or splinter when horses are crowded into it—an important safety factor. Alloy Structures Inc., West Albany Dr., Albany, N.Y., did the fabrication. Other advantages of the aluminum rail are its natural beauty and low installation and maintenance costs.

Westprest Inc., a large **custom stamping plant** located at 523 N. Bivins Ave., Amarillo, Texas, has been

(*Continued on page 25*)

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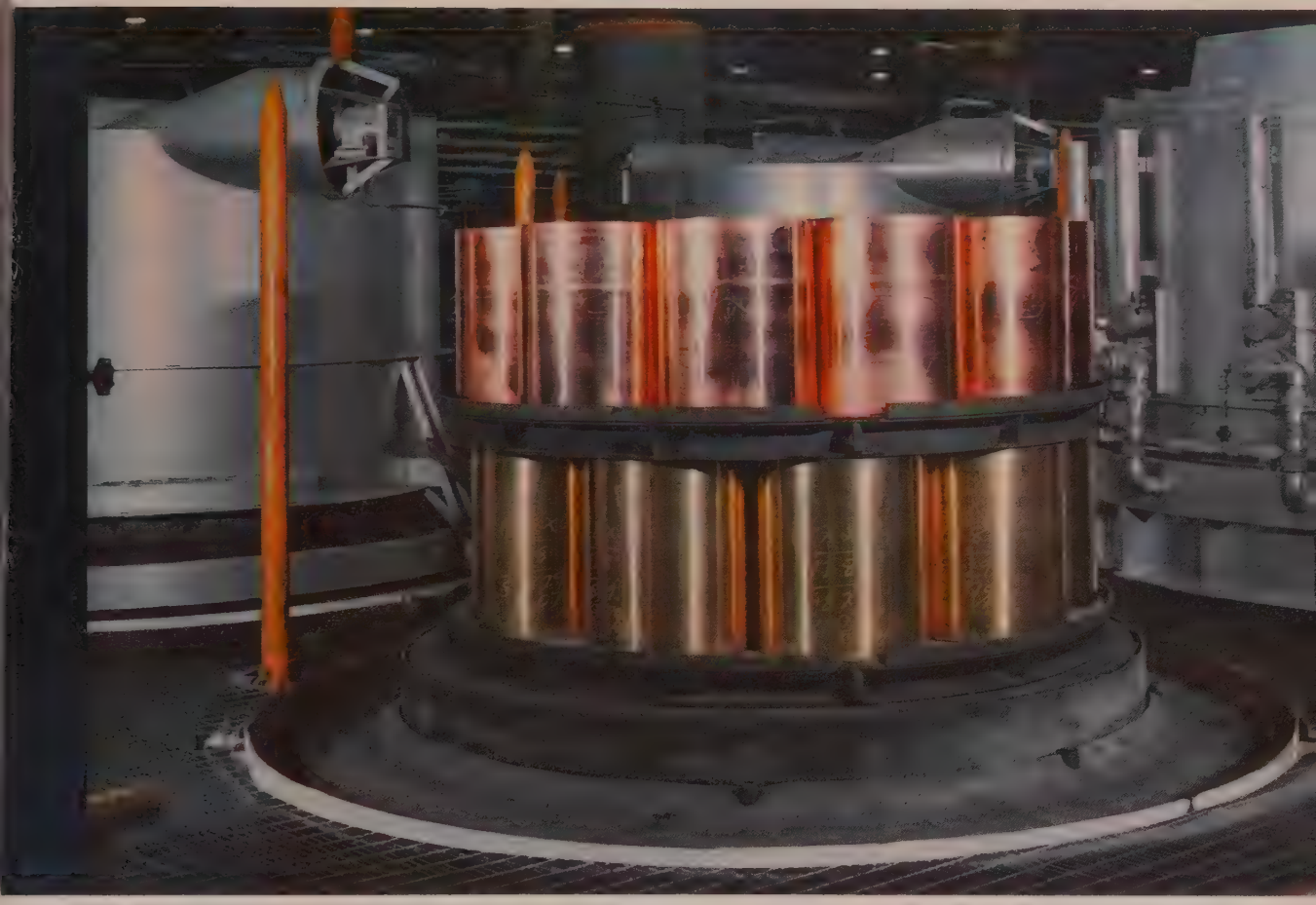

Photograph through the courtesy of Chase Brass & Copper Co., Incorporated

● Really bright clean annealing of copper, brass and aluminum is now an everyday reality because of the Lee Wilson High Convection System for non-ferrous metals.

This mixed charge of copper and brass has been brought to a specified softness without affecting its surface condition. This means less finishing for the fabricator, and a greater desire for this producer's product.

Note the special charge pallets — another Lee Wilson original — that enable producers to further minimize annealing costs. The pallets are designed to carry the charge without affecting the efficient heat circulation through the charge.

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ALUMINEWS

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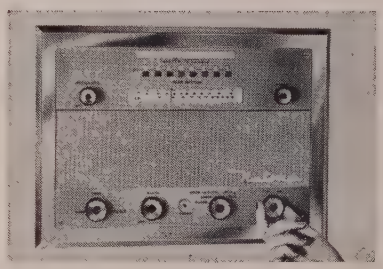
Nutone Stereo Amplifier Control Panels Of Kaiser Aluminum Offer Consistent High Brilliancy



Nutone, Inc., of Cincinnati, Ohio, gained important competitive advantages for their built-in stereo hi-fi systems by selecting Kaiser Aluminum high brilliancy sheet for all control panels. Kaiser Aluminum cost Nutone only one-third as much as chrome-plated steel, yet offers a lustrous finish with a *color* bonus—handsome gold anodizing. This finish is derived from Kaiser Aluminum alloy 5457 that gives consistent high brilliancy.

Nutone stereo amplifiers, and other hi-fi components, offer the latest luxury in stereo listening. The Nutone amplifier is actually two amplifiers, one for each channel, in a single built-in chassis with common controls. It has a power output of 30 watts, amplifies treble and bass responses equally in each channel for precise, undistorted high-fidelity sound with perfect balance. For complete information about Nutone products, mail the coupon below.

"Miracle Mat" Cuts Floor Maintenance Costs 40%

The "Miracle Mat," made by Progressive Engineering Company of Holland, Mich., automatically wipes shoes clean when people enter a building—cuts the cost of sweeping, mopping and polishing floors inside.

Tough brushes running beneath the heavy Kaiser Aluminum grille whisk away dirt and grime when the grille is stepped on. The brushes sweep through the grille opening at a rate of hundreds of strokes per minute, scrubbing shoe soles until the pedestrian steps off the mat.

The "Miracle Mat," complete with grille, electric motor, and catch pan for dirt, lowers into any opening in the floor—wood, concrete, stone or tile. It is available in three sizes for commercial use, plus two sizes for residential installation.

For complete information, mail the coupon below.

Please send me information on the products checked below:

☐ Nutone, Inc.

☐ The "Miracle Mat"

Kaiser Aluminum & Chemical Sales, Inc.
Dept. P-244, Kaiser Center, 300 Lakeside Drive
Oakland 12, California

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Address_____

City_____ Zone____ State_____

KAISER ALUMINUM*

THE BRIGHT STAR OF METALS

*T. M. Kaiser Aluminum & Chemical Corp.

established as a subsidiary of Worcester Pressed Steel Co., Worcester, Mass. Westprest was set up through the acquisition of two adjoining metal fabrication plants — Speedy Mfg. & Sales Corp. and Orna Metal Co. "Westprest's extensive metal fabrication facilities are already being expanded with considerable additional stamping machinery," explained Worcester president C. C. Higgins. "There will be 47,000 square feet of floor area, and with the new equipment, the plant will be the largest custom stamping facility in the Southwest." Paul Cook is president of Westprest Inc.

A steel service center has been opened at 1225 E. Church St., Galion, Ohio, by A. M. Castle & Co., steel and aluminum distributors. The new facilities will serve industry in Lima, Bucyrus, Mansfield, Marion and Columbus, as well as Galion. It is equipped to provide all cut-to-size requirements quickly. The center is managed by Cass Sisler, assisted by Jim Haas, Bob Manroe and John Snodgrass.

Ground was recently broken for a 38,000-square-foot **metal service plant,** being built in Jacksonville, Fla., by Reynolds Aluminum Supply Co. Paul H. Fox, president of the Atlanta, Ga., firm, says the aluminum-clad plant will handle a complete line of aluminum, steel, brass and copper industrial metals as well as other types of building materials. The service center will be staffed with the company sales group already active in Jacksonville. Stanford Davidson will continue as branch manager.

An agreement to develop applications for **titanium diboride** in the aluminum industry has been reached by American Potash & Chemical Corp., Los Angeles, and Firth Sterling Inc., Pittsburgh. Titanium diboride has good corrosion resistance and possesses favorable electrical characteristics, particularly for use as cathodes in aluminum reduction lines. Work on the joint program will be done by Borolite Corp., a Firth Sterling subsidiary, with basic raw materials and specialized equipment provided by American Potash, a boron producer.

Florida-based American-International Aluminum Corp. is building **an extrusion plant** in San Jose, Calif., at 495 Brokaw Road. The $1.5 million facility will cover 50,000 square feet and house a 2600-ton Youngstown Foundry & Machine Co. extrusion press tooled for running 8 by 32 inch billets. Conveyorized plant will also have facilities for converting pig and in-plant scrap to billet, and homogenizing facilities. Thomas Cooper, vice president, says the plant will be in operation sometime in July.

Substantial expansion of its capacity to produce beryllium metal has caused Brush Beryllium Co. of Cleveland to offer 260,000 shares of its common stock. The company plans to obtain $6 million to increase its Elmore, Ohio plant capacity from 35,000 pounds of beryllium hydroxide to 60,000 pounds per month, and to double its vacuum-cast beryllium billet capacity to 24,000 pounds a month. Last year Brush's sales increased to $18 million from $12,700,000 in 1958.

carl mayer Designs and Builds Better ALUMINUM Extrusion AGEING OVENS

This truck type oven is now in service at Penn Extrusion Corporation, Erie, Pa. Close temperature control is maintained through the use of two gas fired, recirculating air heating systems. Other Carl Mayer design features assure trouble-free, economical operation. Write for Bulletin HT-53.

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Useful Data

"Standards for Wrought Aluminum Mill Products" (third revision) has been issued by The Aluminum Association. This 96-page manual presents data on mechanical, physical and other properties, tolerances and other information on standard alloys and mill products. New data have been added and much of the material rearranged by type of product. Included are weight and other data related to specific products, information on thermal treatment, storage precautions and the indication limits for ultrasonic inspection. Free copy can be had by writing on company letterhead to The Aluminum Association, 420 Lexington Ave., New York 17, N.Y.

Rotary slitters and other company machinery are covered in Catalog 10 by Yoder Co. Section on rotary slitting lines details and illustrates machinery and discusses "Profitable Slitting." Another section is on roll forming machines for wide sheets, curving, coiling and ring forming, tubular shapes or lock seaming. Other sections cover electric-weld tube mills, automatic cut-off presses, flatteners and levellers, etc. Copy can be had from R. L. Burt, Yoder Co., 5500 Walworth Ave., Cleveland 2.

Welding aid prepared by Alcoa for engineers, designers and shop men quickly specifies correct filler alloys for all recommended wrought alloy parent metal combinations for the following service requirements: Weldability; strength of welded joint; corrosion resistance; service suitability at temperatures exceeding 150°F; color match after anodizing; ductility. Copy can be obtained by writing to Aluminum Co. of America, 743 Alcoa Building, Pittsburgh 19, Pa.

Aluminum cleaning process called Even-Etch is described in a new bulletin. Process is said to clean wrought or extruded aluminum, remove micro-corrosion and leave the part silvery smooth. It consists of three chemical steps: Removal of microscopic corrosion, oil and dirt; etching; removal of surface smut. It is used before painting, anodizing, spot or inert gas welding. For copy write John R. Gumm, Frederick Gumm Chemical Co., Inc., 538 Forest St., Kearny, N. J., and ask for Bulletin 460.

Welding, brazing and soldering aluminum are surveyed in an illustrated manual by All-State Welding Alloys Co., Inc. Subjects covered include metal-inert-gas (MIG) and tungsten-inert-gas (TIG) welding processes and other arc and gas methods. Brazing chapters detail aluminum alloys, brazing by torch, cleaning and finishing after brazing, and include charts of brazeable aluminum alloys. Soldering section has melt and flow charts, tells how to solder aluminum to other metals, and gives instructions on aluminum soldering with torch or iron, with or without flux. Book contains 12 charts on composition of aluminum alloys, their

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action at speeds up to 7,00
feet per minute on 23" an
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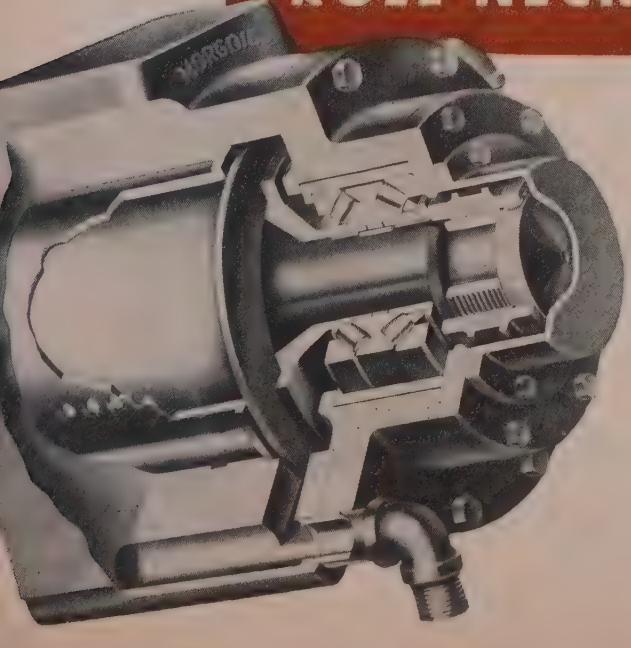

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WIRE MILLS EJECTORS REGENERATIVE FURNACE CONTROL

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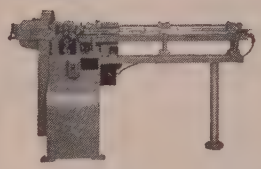
Now High Speed Straightening and Cutting of Fine Wire .020" to .080"

New SHUSTER

MODEL A

produces up to 12,000 pieces per hr.*



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2. Geared to feed 125 F.P.M.
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The *New* Model A from SHUSTER, the *oldest* name in the trade, raises production sights for the most-used wire between .020" and .080" diameters. This *constant speed, electrically controlled* machine, with advanced engineering features, incorporates the same skill and care in manufacture that keep SHUSTERS performing at peak efficiency far beyond normal life expectancy.

Users report their *New* '58 Model A High-speed machines have already paid for themselves. Send us your wire straightening and cutting requirements from .020" to 11/16".

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AT-13

mechanical and physical properties, recommended filler alloys for MIG and TIG welding. For copy contact R. H. Mandel, All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.

Elevated-temperature magnesium alloys are described in a new 28-page shop guide put out by Dow Chemical. Recommended practices for working magnesium alloys of the thorium and rare-earth-metal families are covered. Shop operations include machining, chemical milling, forming, joining, assembly protection, and finishing. Tables list tool temperatures, bend radii and various welding data. Alloys discussed are designed for missile and aircraft applications at temperatures through 800°F. Booklet is available from Magnesium Sales Dept., The Dow Chemical Co., Midland, Mich.

Two refractories bulletins—one on castable (Kromform—Bulletin 72), the other on bonding mortar (Kromtite—Bulletin 73)—have been published by H. K. Porter Co. Both are guides to basic product selection, application and service. Facts are classified under these headings: What It Is; Where Used; Outstanding Features; How to Apply; How Shipped; Estimating Requirements; Where to Buy. For bulletins, write John S. Marsh, Refractories Div'n, H. K. Porter Co., Inc., Porter Building, Pittsburgh 19, Pa.

Aluminum products of Revere are detailed in a new 36-page catalog. Special sections discuss quality and features of company's aluminum, and 27 fabricating procedures as applied to firm's products. Other sections cover properties and applications of non-heat-treatable and heat-treatable alloys; sheet products; extruded rod, bar, tube and shapes; seamless drawn tube and bus conductors. Another chapter includes other company products such as rolled shapes, lockseam tube, heat exchanger tube, forgings and foil. For copy write Dick Snively, Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y.

Ultra-high purity gases, their properties, applications and storage requirements, are covered in a new booklet. Argon, neon, helium, krypton, xenon, radioactive gases and special mixtures have a variety of uses as protective atmospheres, refrigerants, insulators, radiation sources, etc. The booklet contains charts and graphs showing the results of extensive testing on heat conductivity, excitation potentials, and discharge characteristics. For Bulletin F-1002c, write Linde Co., Div'n of Union Carbide Corp., 270 Park Ave., New York 17.

Fastening without "fastening corrosion into your products" is subject of booklet by the H. M. Harper Co. Seven types of corrosion are described, and hints are given to minimize them. Included is a list of Harper's corrosion resistant alloys. Covered are aluminum alloys, stainless steel, nickel and copper base alloys, and high temperature materials such as titanium. A corrosion guide helps the engineer decide what

Bridgeport Pre-painted Aluminum Strip is downright unique! Mirror smooth surfaces possess unusual hardness, are wear-resistant and virtually scuff-free during all forming operations. The special 2 coat finish utilizes a remarkable primer bonded tightly to the metallic surface. It strengthens the final coat, eliminates chipping, and insures maximum density and uniformity of color. Corrosion creep is simultaneously inhibited—even along metallic edges exposed in punching or shearing.

Bridgeport Pre-painted Aluminum Strip eliminates painting, insures a *superior* finish *without* finishing costs ...is proved by billions of feet now in worldwide use on Flexalum Venetian Blinds and exterior awnings. *Here is the ultimate in long lasting, exterior durability, resistance to chemical attack, sun, salt spray, wind and rain!* Now available in an almost unlimited range of sun-fast colors for a wide variety of applications.

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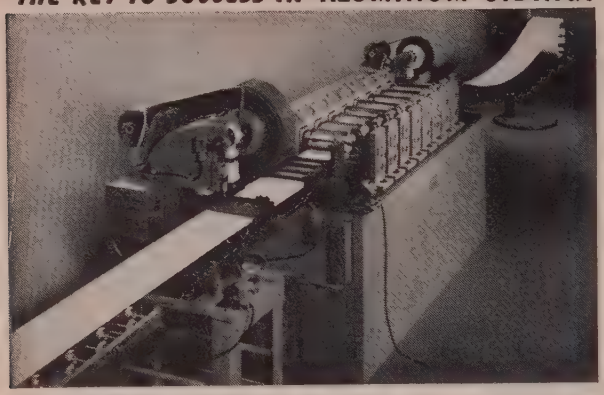

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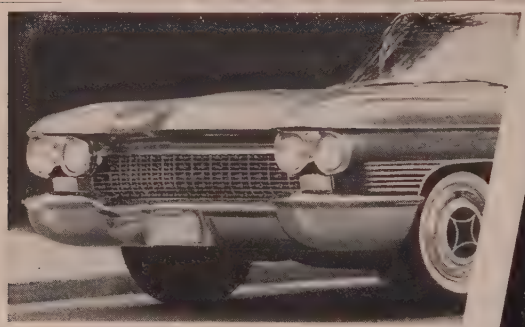

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metals to use for particular applications. For copy write R. D. Tuttle, The H. M. Harper Co., 8200 Lehigh Ave., Morton Grove, Ill.

Industrial furnaces are the subject of a brochure by Sunbeam. Detailed and illustrated are aluminum melting, homogenizing and vertical extrusion heat treating furnaces. A special chart shows heat treating processes and applicable furnace and protective atmosphere types. These furnaces are built and shipped as complete units. For brochure write R. K. Stephenson, Sunbeam Equipment Corp., 180 Mercer St., Meadville, Pa.

Aluminum in heat-exchanger fabrication is the subject of a new publication by Reynolds Metals Co. It summarizes in 16 pages of charts and pictures, technical information needed by the heating engineer, fabricator and industrial purchaser. Text covers aluminum heat transfer rates, temperature properties, tensile strengths, pressures and dimensional tolerances. Charts provide information on aluminum stress values, working pressures, thermal expansion and conductivity and friction factors, Also explained is how aluminum's advantages can be put to use in design and construction. Write to Reynolds Metals Co., Dept. PRD-2, Box 2346, Richmond 18, Va.

Aluminum for architecture is discussed in a new brochure by Olin Aluminum. Included are a chapter on new architectural forms, a chart listing Olin alloys, and their applications, and another chart listing typical properties for heat-treatable and non-heat-treatable alloys. Other sections cover mechanical and chemical finishing, anodizing, and applied finishes such as porcelain enamel. The book closes with a suggested outline of specifications covering 11 points. For copy write Gayle Maile, Olin Mathieson, Metals Div'n, 400 Park Ave., New York 22.

Textured metals are subject of new brochure showing special textures in aluminum and other metals, and how manufacturers have applied these materials to various products. Listed are special finishes and colors. Also discussed are strength, durability, style, utility and economy of products. A new solvent-activated adhesive applied to sheets' back is also detailed. For copy write H. A. Davis, Ardmore Products Inc., Aldene Rd. and First Ave., Roselle, N. J.

The value of cut machining, in which both cut ends of metal rods, angles, channels, I-beams and solid bar stock are cleanly cut with circular abrasive saws, is described in a new illustrated catalog. Pictures and test results detail the Wallace line of modular, combination cutting and deburring, swing type and rotator units. Booklet also covers firm's line of band saws. You can have a copy by writing C. L. Longley, Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, Ill.

10 big reasons why B&T offers you a superior AUTOMATIC ZINC DIE CASTING MACHINE...

The extra strength and precision built into B & T Die Casting Machines gives you thousands of hours of trouble-free operation . . . helps you to increase production and reduce operating costs.

See this B & T Automatic Hot Chamber Die Casting Machine in operation. Look it over. Note the motorized die height adjustment, automatic die lubrication, large conveyor area for automatic part removal, and many other advantages that really pay off on the production floor. Your B & T representative will be glad to make all arrangements to show you this machine.

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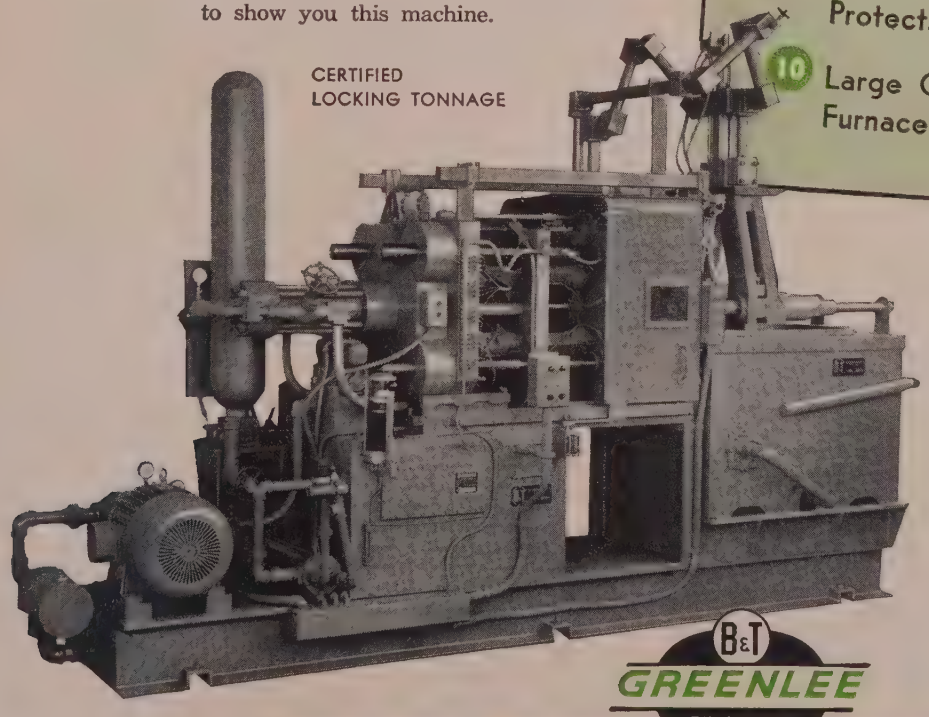

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Part 1:

THE ALUMINUM HEARINGS

Yates Congressional Committee takes its third look into the aluminum industry; hears complaints from die casters, scrap dealers, smelters and extruders. Next month, Part 2 of this report will feature testimony of siding manufacturers, auto makers, government officials, and primary aluminum producers.

MERGERS, hot metal deals, exports of aluminum scrap, and relative pricing of aluminum pig and mill products were the principal points of inquiry during four days of hearings held early last month in Washington by a committee of the U. S. House of Representatives.

Known officially as Subcommittee No. 3 (on Foreign Trade and Foreign Aid) of the Select Committee to Conduct a Study and Investigation of the Problems of Small Business, this group had conducted two previous investigations of the aluminum industry — in 1955 and in 1957-58. In this latest renewal of the aluminum hearings, Representative Sidney Yates once more served as chairman. Other committee members were Congressmen Multer, Moore and Derwinski. Victor Dalmas was minority advisor.

In his opening remarks, Chairman Yates noted that there was a severe shortage of aluminum when the committee first looked into the industry in 1955, and that there was an overabundant supply during the hearings in '57.

"Today we see evidence that the industry has been successful in expanding its markets," he observed. "I remember that in 1957 we commented that in times of overabundance the plight of the small fabricator in the aluminum industry was going to be acute because the market (for their products) was going to be gone after by the primary producers, as well. . . . That has been shown to have occurred. . . ."

Yates further noted that there have been "significant" mergers in the aluminum industry in the past few years: that hot metal contracts "have been increased" and impose additional problems; that the committee "continues to receive complaints" about the price squeeze; and that "another complaint that we have received relates to the increased export of aluminum scrap."

Hot Metal Deals Shrink Independent Die Casters' Sales To Auto Industry; Present Laws Should Provide Relief

R. E. Kellers — American Die Casting Institute

Having thus established the reasons for the hearings, Yates called on the first witness — Richard E. Kellers, associate secretary of the American Die Casting Institute, Inc. Kellers was substituting for ADCI secretary David Laine, who was out of the country.

Kellers read a brief statement recalling David Laine's testimony at the earlier hearings during which the hot metal contracts between Reynolds Metals and the auto makers were discussed.

"The reduction in price which Reynolds gives Ford and General Motors is six to eight times what Reynolds saves by eliminating the pigging operation," Kellers noted. "The effect of this price discrimination has been to encourage vast expansion of the captive die casting facilities of Ford and GM with a resultant large increase in the aluminum die castings they make for themselves and a severe drop in the tonnage of aluminum die castings which they buy from custom die casters. . . . "

Kellers referred to a table comparing the tonnage of die castings purchased from independent die casters with the tonnage produced in the auto makers' captive facilities (see table). In 1955, he pointed out, the auto makers bought 70.9% of their aluminum die castings and produced 29.1%. Last year, they purchased 38.4%, produced 61.2%.

"This complete reversal should clarify the impact of the discriminatory hot metal price on the volume of aluminum die casting business available to independent die casters," he declared.

Back in April 1958, Kellers continued, the ADCI took its complaint to the Department of Justice. But after a year of investigation, Justice decided it was a matter for the Federal Trade Commission. The FTC took the case in May 1959, and was ready to close the case without action in February 1960.

"We are forced to conclude that existing legislation is inadequate," Kellers concluded. "In the absence of relief the future of the independent custom die caster is a most discouraging one. We beg your assistance in providing remedial legislation."

Chairman Yates began the interrogation with a question concerning the

Automotive Use of Aluminum Die Castings — Custom Vs. Captive

YEAR	Passenger Car Production	Purchased from Custom Die Casters (millions of lbs.)	Produced in Captive Plants (millions of lbs.)	Total Automotive Use (millions of lbs.)	% Custom (Bought)	% Captive (Made)
1955	7,920,000	117	48	165	70.9	29.1
1956	5,816,000	93	63	156	59.7	40.3
1957	6,115,000	115	70	185	62.0	38.0
1958	4,241,000	58.5	64.4	122.9	47.6	52.4
1959	5,594,000	66	104	170	38.4	61.2

Source: American Die Casting Institute

AQUADAG® SOLVES AN INTRICATE MOLD PROBLEM FOR OSWEGO CASTINGS

A complete permanent mold, used in casting high-pressure gas meter housings, is shown being sprayed with 'Aquadag'.

The problem at Oswego Castings Corporation, Oswego, New York, a division of Oberdorfer Foundries, Incorporated, involved the effective metal flow and release of aluminum castings. Frequent breakage occurred due to the complexity of the part . . . a gas meter housing containing an integral rib down the center. In the mold core, the relatively tiny aperture for forming the rib, plus the rounded corners which provide the outer "bucket" appearance to the housing, demanded a release agent that would permit easy extraction and proper metal flow.

According to Frank Fox, Production Foreman in the Oswego foundry, previous to adopting the use of an Acheson dispersion, removing the aluminum casting from the rib aperture took as long as three or four hours. Even with such care, sticking caused many castings to break at the point of the rib.

There was also the problem of metal flow. Housing walls vary in thickness between ¼ inch and the ⅝ inch flange which runs around the top. Close tolerances must be maintained to insure a proper fit during final assembly. "Holidays" caused by the improper flow of metal into critical areas of the cavity, presented a constant reject problem.

Several mold washes were tried unsuccessfully before Oswego engineers turned to 'Aquadag'—a dispersion of colloidal graphite in water. In their application, Oswego dilutes the concentrated material 1 to 3 with water. Normal commercial spray equipment is used in applying an even coating on all mold surfaces . . . one coating holding up through a run of eight to ten pieces. The 356 aluminum alloy used for the housing castings, is poured at 1400°F. The mold is preheated to 700°F. and maintained at that temperature through the casting cycle.

With 'Aquadag', the savings at Oswego have been "considerable". Castings are more uniformly formed, have smoother surface finish, and part easily. Because of greatly facilitated metal flow and release, mold life is lengthened. Rejects are the exception rather than the rule.

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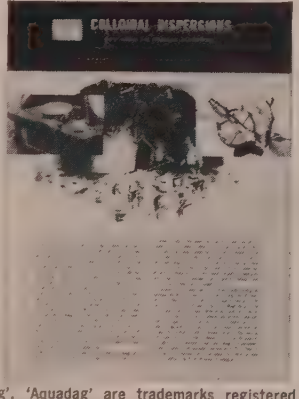

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fate of custom die casters who have lost so much of their automotive business. "Have any of them gone out of business?" Yates asked. Here is Kellers' reply and portions of his testimony.

Kellers. No. To the best of my knowledge none of them have had to sell out.

Yates. Have your members taken up or moved to other industries?

Kellers. I wouldn't say that. . . . In many cases they have had to readjust their business to the die casting of other metals to compensate for their loss of aluminum die casting business.

Yates. If, as you allege, the difficulty is in great measure brought about by the hot metal contracts, it looks like your difficulties are going to be compounded by the new hot metal contract (between Alcoa and GM).

Kellers. I would think so. We have no actual details of (this) contract, but we understand the basis of arriving at the price is quite different from the Reynolds contracts with GM and Ford. . . .

Apropos of the chart, I might point out one thing. The other metal principally used in die casting is zinc.

In 1955, when 521,000 tons of automotive zinc die castings were used, the independent die casters produced 62.8%, while 37.2% were produced in captive facilities.

In 1959, when fewer automobiles were turned out, 350,000 tons of zinc die castings were used, of which 62.6% were purchased and 37.4% were produced by the car makers.

We believe this is how the picture would look for aluminum if metal were not available to the captive die casters at discriminatory prices. . . .

Multer. You said that the Federal Trade Commission in February 1960 was ready to close the case without action. Have they closed it or are they still pursuing it?

Kellers. On February 4th we were

R. E. Kellers

" . . . Existing legislation is inadequate."

notified that if information which was requested was not received by a given date, their files would be closed. We subsequently gave them the information and we have had no further contact with them.

Multer. Don't you think your statement is unfair when you say the FTC . . . were ready to close the case without action? They were ready to close the case only if you failed to submit data.

Kellers. We felt that all of the data we were able to furnish was available through the information which had been developed originally for the Department of Justice.

Multer. Have you made any further inquiry to find out what they are doing?

Kellers. No, we have not.

Multer. Mr. Chairman, I think it would be appropriate to ask the FTC to advise us as to the present status of the matter.

At this point Congressman Derwinski wanted to know how successful the independent die casters had been in getting business from other markets to compensate for their loss of automotive business. Kellers did not have that information available, but assured Derwinski that he would attempt to get it.

The following several minutes of questioning failed to bring out anything significant, until Congressman Multer came up with this query:

New Laws? I Don't Know

Multer. I notice that you suggest we need additional legislation. What form should that legislation take?

Kellers. We are not in a position to suggest the actual legislation . . .

Multer. We are looking for the information that can guide us in legislating. . . . I don't know just what we could do legislatively, and I would like to have your guidance and your help.

Kellers. We believe that the Robinson-Patman Act does cover this situation. . . . But we have been unsuccessful with either the Department of Justice or the FTC to get recognition of that.

Multer. Then I think the job that faces this Committee is what pressures the Congress can place upon the Administration to see that the law is properly enforced.

Kellers. Yes.

At this point, Victor Dalmas, counsel for the minority, questioned Kellers on the precise effects of the hot metal contracts on the business of independent custom die casters. Dalmas wanted to know what percentage of the loss of automotive business was directly attributable to the hot metal contracts.

Kellers replied that it would be "very difficult to pin it down percentage-wise" but that "we think that the reversal of trend is largely due to the hot metal contracts."

That concluded Kellers' testimony. Yates then called the next witness, Carl Burton, Secretary of the Aluminum Smelters Research Institute.

Soaring Exports of Scrap Threaten Smelters' Supply; Bill to Increase Aluminum Tariff Should Be Defeated

Carl Burton — Aluminum Smelters Research Institute

In his 2600-word prepared statement, Burton treated the committee to a scholarly dissertation on the origin, nature, function and future of aluminum scrap. For the purposes of this report, however, a review of his chief complaints will suffice.

The plight of the secondary smelters has been aggravated by heavy exports of aluminum scrap, which have been increasing since July 1959, according to Burton. "We have appealed to the Department of Commerce, requesting that exports be reduced and controlled under the Export Control Act (but) our repeated pleas have been denied on the grounds that 'at this time exports do not warrant controls.' "

Burton believes that the Business and Defense Services Administration agrees that "grossly increased exports of aluminum scrap are detrimental to the development of the domestic smelting industry and its foundry customers." But he is convinced that someone is overriding BDSA's recommendations.

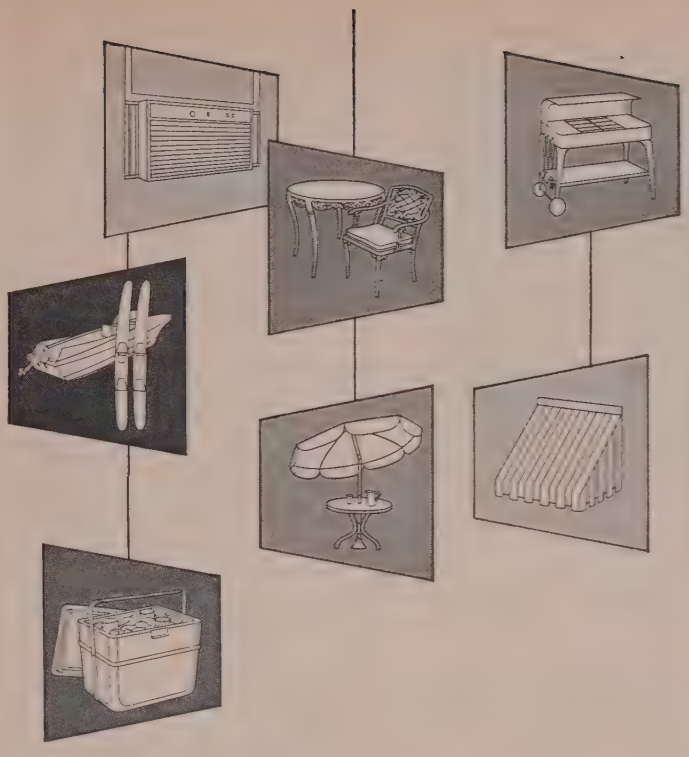
"We think this committee should ascertain where and why this obstruction exists, and recommend the means to remove it," he declared.

As evidence of the threat, Burton offered a table (illustrated) showing imports and exports of aluminum scrap from 1950 through 1959 and projected for 1960.

"Exports in the first quarter of 1960 were three times those of the first quarter of 1959," he pointed out. "If 1960 continues at (that) rate we will export over 120 million pounds this year."

Exporting American Jobs?

Noting that over 280 million pounds of aluminum scrap had been exported from 1954 through '59, Burton compared this to "exporting American jobs." If most of this scrap — "say, 200 million pounds" — had been retained at home for



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processing into ingot "it would have resulted in furnishing approximately 1.5 million manhours to transform that scrap into ingot."

Switching his attention to hot metal deals, Burton suggested that "since the other hot metal contracts . . . are in the records of this committee, it would seem only right that the terms of this new contract (between Alcoa and General Motors) be included also."

The secondary smelting industry has never been opposed to hot metal deals, according to Burton. "Our sole and continued objection is the unfairness of the pricing of hot metal, representing . . . preferential discounts beyond the actual saving to the aluminum producers. It is our contention that (this) contravenes the Robinson-Patman Act."

Finally, Burton called for defeat of proposed legislation which would increase the duty on imports of aluminum pig to 4 cents per pound. "Passage of such legislation would place additional burdens upon many of our foundry customers . . . and would be an out-and-out invitation to reprisals by other nations," he warned.

Burton asserted that the right of the small independent smelter and foundryman to exist and prosper is being abridged, and that the power to correct this situation resides in the Congress and the regulatory agencies.

"Many words have been recorded; we feel it is now time for action," he concluded.

That completed Burton's prepared statement. Yates opened the questioning as follows:

Yates. How many members of your association are there?

Burton. We have 16 members, and there are 60 to 65 smelting plants in the country.

Yates. And all of them are affected?

Carl Burton

"Grossly increased exports of aluminum scrap are detrimental . . . "

Burton. Yes, any independent smelter.

Yates. Are all of your members independent?

Burton. Yes.

Yates. Apex Smelting Co. was a member and I wondered whether it was still independent. I was under the impression that there was a contract for the purchase of Apex.

Burton. That was announced, but I have heard of no consummation of it.

Multer. You have presented an interesting picture with reference to what the Department of Commerce is or is not doing. Apparently, it is a matter of administration . . .

Burton. I think it is . . .

Multer. I wonder whether the Department is subject to pressures from other agencies.

Burton. That is something the committee could determine. I suspect it to be true. . . .

Multer. We can try. Of course, the State Department is encouraging the underdeveloped countries to develop industry. That means they are going to increase imports eventually.

Burton. The recipients of our aluminum scrap are far from underdeveloped.

Congressman Multer went on to point out that the Secretary of Treasury has called for increased exports to improve the balance of trade. Multer suggested that that is what's happening as far as aluminum scrap is concerned.

Burton objected, pointing out that as a raw material, scrap cannot bring in much revenue, compared with the finished products it is used in.

Later on, Yates asked if the smelters had lost any business as a result of the high level of scrap exports. Burton thought they had, but added that he was more worried about the latter part of this year and next year and the following years.

Later on, Congressman Moore initiated the following line of questioning:

Moore. I was very interested in the manner in which you explain . . . the fact that the export of aluminum scrap is in essence the export of American jobs. But you treat it differently than if this industry was being subjected to a mass of imports of aluminum . . .

'Take the Chryslum Deal'

Burton. Maybe I failed to make myself clear. The Chryslum deal is an excellent example of the exporting of jobs. (Chrysler) foresaw a tight position on scrap. The company had always relied on smelters secondary alloys. They made a survey . . . and determined that there was not sufficient scrap in the country to take care of their additional requirements. They then made the deal with Alcan. That metal is all obtained from Canada now, none from the U. S.

Now, exports of raw materials provide articles that are brought back into this country as competitive imports. It doesn't seem to be the point the President is interested in. It seems to me they are interested in building exports of finished articles, not raw materials.

Here is a raw material that is the base of an industry of small businesses. Why do we bleed it, when there is plenty of primary aluminum in the world market that these foreign countries could absorb if they would throw off their high tariff on primary metal?

Later on, Congressman Derwinski referred to Burton's concluding statement —"We feel it is now time for action."— and asked for guidance on the type of action the committee should take. Burton replied that the committee "should find out why the Export Control Act is being administered the way it is with respect to aluminum scrap. . . ."

Congressman Multer pursued the

Exports and Imports of Aluminum Scrap

(millions of pounds)

Year	Exports	Imports	Net Metal Gain (+) Or Loss (−)
1950	1.6	35.8	+ 34.2
1951	2.8	40.0	+ 37.2
1952	2.0	13.8	+ 11.8
1953	9.0	53.2	+ 44.2
1954	78.6	16.0	− 58.6
1955	36.6	42.6	+ 6.0
1956	38.3	22.8	− 15.5
1957	36.3	26.3	− 10.0
1958	37.8	19.8	− 18.0
1959	65.0	20.0	− 45.0
*1960	120.0	20.0	−100.0

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point with this question:

Multer. The die casters apparently have an ample supply today. Their main complaint, I gather, is price discrimination. They suggested that it is not legislation they need. . . . Do you believe, too, that legislation is sufficient if properly enforced?

Burton. I would question very much if there were any need for additional legislation . . .

More Scrap From Autos?

Multer. Now, with the automobile industry, through its captive plants, using at least 40% more die castings than that produced by the custom die casters, isn't it fair to assume that they are producing also at least twice as much scrap?

Burton. Which scrap do you mean? The scrap from the machining of castings? Or the return of the wrecked automobile years from now?

Multer. Let's take both.

Burton. The scrap from the machining of the castings — and it is not great, as you go into permanent mold and die castings — may go back to the producer, or it may go to the smelters. I cannot tell you how much in either direction.

Dalmas. In connection with these increased exports of scrap, how much of it is by fabricators in this country who ship to subsidiaries in other countries?

Burton. I have no way of knowing. I think the Bureau of the Census, possibly the BDSA, might be able to give you those figures.

Dalmas. Wouldn't a fabricator, whether he were a primary producer or whatever he might be, have a perfect right to ship that scrap without any controls anywhere in the world?

Burton. I see no law to prohibit him from exporting his own scrap. But you have to carry it further. Is it being exported in competition with world markets, or is it to deplete the system? Have they got too much aluminum in their system? If they have, why don't they shut down a potline?

Primary Exports Up, Too

Dalmas. Well, I notice from the Department of Commerce figures that the export of primary pig has increased 130% in 1958 to 1959 — a total of about 242 million pounds.

Burton. I think it should increase further.

Dalmas. So we are exporting increased quantities of both primary aluminum and scrap.

Burton. That is right. And the primary aluminum capacity has increased, whereas the availability of scrap has not increased proportionately.

Dalmas. Imports of aluminum scrap have decreased. Why did that happen?

Burton. World market prices are probably too high to allow us to bring it into this country.

That, for all practical purposes, concluded Carl Burton's testimony.

Controls on Aluminum Scrap Exports Not Needed; Shipments Overseas Help Stabilize Scrap Market

M. J. Mighdoll — National Association of Waste Material Dealers

The next two witnesses were representatives of the National Association of Waste Materials Dealers, Inc. The first was M. J. Mighdoll, administrator of the association's Foreign Trade Division and Metal Dealers Division. These two divisions, he said, speak for the majority of nonferrous scrap metal dealers and exporters in the U. S.

In essence, Mighdoll challenged Carl Burton's stand on exports of aluminum scrap. He quickly pointed out that there are two kinds of scrap exports: 1.) Traditional shipments of dealer scrap through established trade channels; and 2.) exports of producers' scrap "which represents, we believe, a substantial tonnage of current shipments. . . ."

He further noted that all scrap exports go to friendly countries; that exports constitute only a fraction of dealers' total shipments; and that secondary smelters consume 80% of all the aluminum scrap used in the U. S. He also suggested that unless other outlets for scrap are available, it would become a "captive" market, subject to control by the smelters.

Mighdoll pointed out that the smelting industry has suffered no harm to its growth since 1954 when 78 million pounds of scrap were exported; that exports of 64,757,000 pounds last year represented only 7% of total consumption of aluminum scrap; and that scrap exports last year were only 71% over the 1958 level, while exports of primary metal rose 130% in the same period.

He went on to cite figures showing that scrap prices remained stable during this period, despite an increase in the price of primary pig.

In conclusion, Mighdoll noted that "the movement of scrap for export at times when smelter buying ebbs permits the continued collection of scrap from small factories . . . granting them a fair return for the scrap. Were there no exports at such times, this scrap might be uncollectible because of vanishing profit margins. . . ."

When Mighdoll had finished his prepared statement, Chairman Yates asked him what he thought of Carl Burton's testimony. Did he agree with Burton that increased exports of aluminum scrap signalled an "alarming trend"? Here is Mighdoll's reply and portions of his subsequent testimony:

M. J. Mighdoll

"Unless other outlets for scrap are available (it) would become a captive market."

'Exports Not Alarming'

Mighdoll. I see no alarming trend, nor do any of our members. If you compare consumption figures in the U. S. — not exports, just domestic scrap consumption, which is mostly by smelters — there is a substantial increase.

It went from 752 million pounds in 1958 to 912 million in '59, or about 20% in one year, which indicates that if the demand is there, the industry has the ability to produce the needed scrap.

Yates. What is the lowest price for aluminum scrap in the last 10 years?

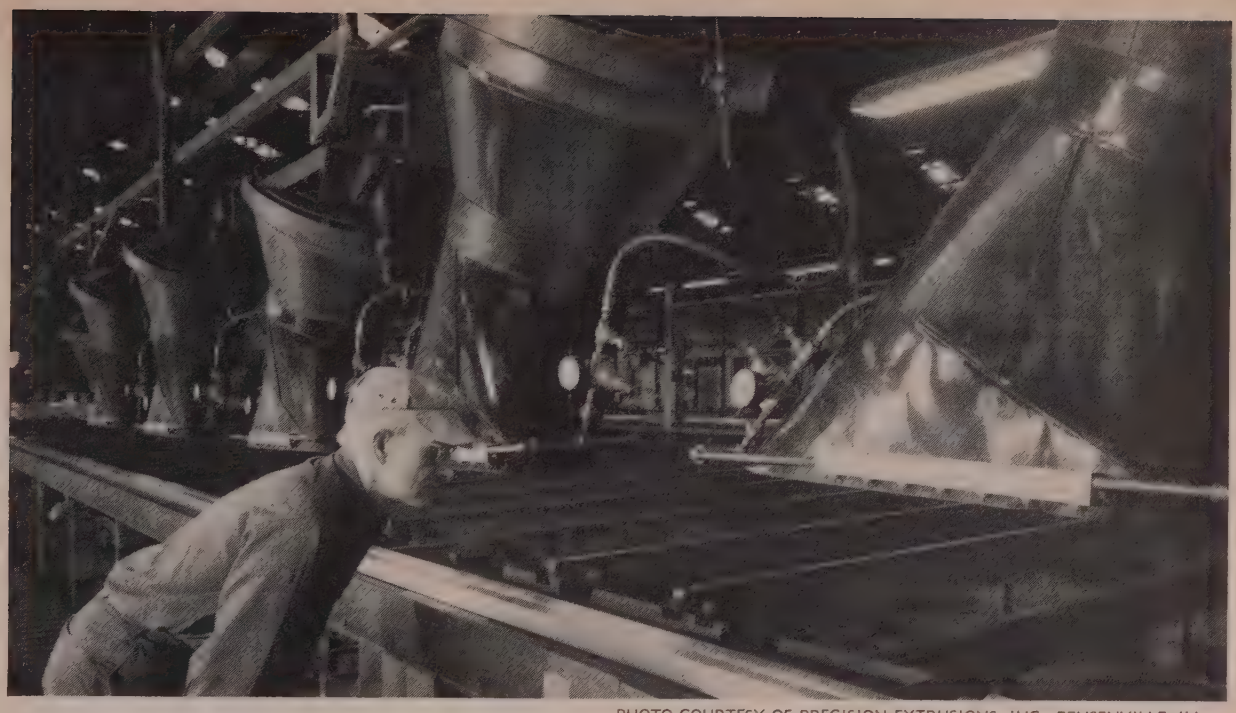
Mighdoll. I wouldn't know when you take in a period as long as that.

Dalmas. Mr. Chairman, in line with your question about scrap prices, I have a Department of Commerce table showing scrap prices from 1953 through 1959.

The range in 1953 was 10½ to 17; in 1954, 13 to 16-plus; in 1955, the year of the shortage, it went from 16⅜ to 24 cents. It was about the same in 1956, and in 1957 the range was 17 to 18½; and in 1958, from 15¼ to 17¾. In 1959 it was 17¼ to 18½ . . .

At the same time, exports increased and imports decreased. I would like to ask Mr. Mighdoll to explain why.

Mighdoll. The fact that the imports have decreased would seem to indicate



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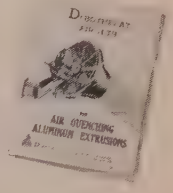

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that there has been no strong demand.

Dalmas. If our imports have decreased, certainly the demand must be strong in the countries that we normally import from. At the same time our exports have gone up.

Mighdoll. That is true.

Dalmas. Given those two factors, why has our demand for scrap in this country lessened in the last two years?

Mighdoll. I don't think it has, as shown by the figures. Between 1958 and '59, domestic consumption of aluminum scrap has increased approximately 20%.

Dalmas. I notice that many export items of aluminum have increased, and that our imports of aluminum have increased very materially.

For example, the Department of Commerce on February 5, 1960, has a release saying that imports of fabricated products in the U. S. increased 80% over 1958: and sheets, bars, and so on 82%, and all the way down the list. Those items coming in would also indicate an increased scrap production.

Mighdoll. The portion which becomes scrap is in addition to the scrap generated from domestic metal.

Dalmas. Taking pig aluminum and shipping it abroad—which we are doing in large quantities—isn't that in a sense the same export proposition?

Mighdoll. Yes.

Dalmas. Should we stop? What controls, if any, should we put on the export of aluminum of any kind?

'No Controls Needed'

Mighdoll. We feel there should be no restrictive quantitative controls. As a matter of fact, Mr. Burton made his statement that he wants his industry to operate in a free and open market. That is the wish we have for our industry. At this very moment we are supporting legislation which seeks to continue the suspension of import duty on aluminum scrap. That could possibly work to the disadvantage of our domestic dealers, but we have always taken the position of free trade.

Dalmas. Do you think that any of that scrap or aluminum exports of any kind that we are making are going to countries that we would prefer not to deal with?

Mighdoll. No. The Government keeps very good statistics on which countries are receiving aluminum scrap . . .

Dalmas. You are an exporter, and you would know what is going on abroad. These large quantities that we have been shipping to friendly countries in Europe—would you know whether that was being manufactured for local consumption or for trade that would be to our disadvantage?

Mighdoll. I am not an exporter . . . but our members are exporters. And we would, I think, become aware of any such thing, were it true. I know of nothing at this time that represents any fears in that manner.

That ended Mighdoll's testimony.

Hot Metal Deals Discriminatory; Primary Producers Show Signs of Pursuing Secondary Smelters' Markets

Si Wakesberg — National Association of Waste Material Dealers

Yates called the next witness, Si Wakesberg, secretary of the Secondary Metal Institute of the National Association of Waste Material Dealers, Inc. This division, he said, represents some 120 firms of which about 40 are aluminum smelters.

Wakesberg read a prepared statement supporting the stand of the American Die Casting Institute with respect to the hot metal contracts. As such, it did not add anything new to the controversy.

At previous hearings, Wakesberg explained, it was pointed out that "hot metal contracts grant a discount of roughly 10% of the list price of 99%—plus pig aluminum, after deducting the freight factor. Based on the current published 26-cent price for pig aluminum, such a discount should come to about 2.5 cents a pound."

But smelters dispute this figure vehemently, Wakesberg declared. "A consensus among smelters is that the price of pigging lies in the neighborhood of ¼ to ½ cent a pound. . . . It is this type of 'preferential and discriminatory' pricing policy that makes it tremendously difficult for our customers . . . to compete actively with the 'captive' plants."

Wakesberg also charged that the primary producers have shown signs of pursuing the secondary smelters' traditional market (foundries and die casters) by cutting the price of alloy ingot without reducing the price of aluminum pig.

In conclusion, Wakesburg voiced the belief that "it is certainly within the jurisdiction of this committee to investigate the facts and see whether these abuses are a threat to small business."

Yates began the interrogation by asking Wakesberg where he got his figures (¼ to ½ cent per pound) for pigging metal. Wakesberg replied that he had polled the members of his association.

Yates then asked if Wakesberg agreed with the suggestion, made at the earlier hearings by J. H. McConnell of Reynolds Metals, that hot metal is a new form of primary aluminum. Wakesberg disagreed, citing Carl Burton's "hot jelly" analogy. (At the earlier hearings, Burton had compared primary aluminum to jelly—it's still jelly whether it's put in a jar to jell or served hot directly to the table.) Victor Dalmas then began this line of questioning:

Si Wakesberg

"Earlier this year the producers cut the price of . . . alloy pig (but) didn't reduce the price of aluminum pig . . . "

How Would You Price It?

Dalmas. Suppose one of your members had an opportunity to secure a hot metal contract by having a die casting plant or some other plant beside the smelter. How would your member go about figuring the price of hot metal?

The reason I ask is the fact that everybody says the (hot metal) price of the primary producers is wrong. Nobody has come up so far and told us what is the proper way.

Wakesberg. All we are saying is this: If it costs a quarter or a half cent a pound to pig the metal, and if an aluminum producer is (allowing) 2½ cents a pound for that, and it is only because he is in a position as a large producer to make this kind of a contract with a consumer, then we feel that is far and above what he should be (allowing) for that metal.

Dalmas. You couldn't give me a mathematical equation as to exactly how to arrive at the hot metal prices?

Wakesberg. I cannot give you that.

Dalmas. Isn't this one of the factors that is bothering the secondary smelters? Isn't the cost of producing secondary pig, at an 18-cent price for scrap, higher than the primary producer could take

(*Continued on page 43*)

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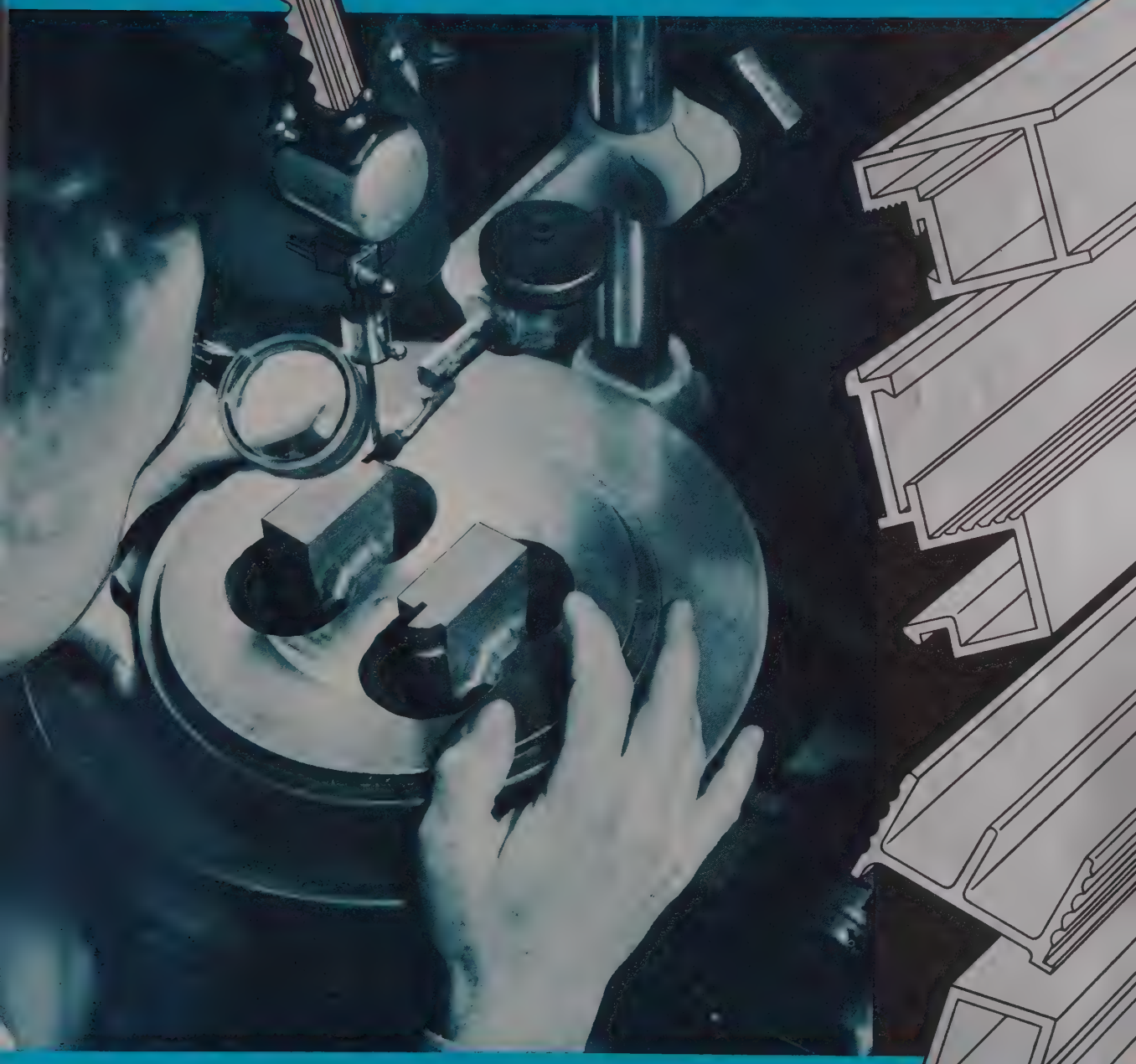

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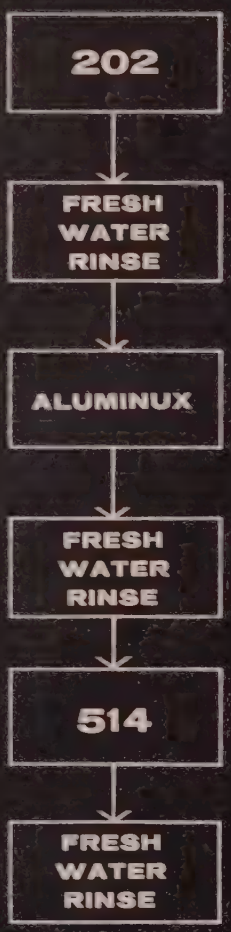

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the bauxite and alumina and come out with a pig of the same grade?

Wakesberg. I don't have those figures. I might be able to check and see if that is so.

Yates. I don't understand the question.

Dalmas. I am just assuming, perhaps erroneously, that with 18-cent scrap, the smelters perhaps are up against a cost factor that the primary producers do not have.

Wakesberg. I don't know these figures, and I can't comment on them. . . . But it is true that the secondary smelter is caught sometimes in a price squeeze between the price of the primary aluminum alloy and the cost of the scrap.

Yates then made a prolonged and unsuccessful attempt to find out whether there was any pricing formula within the secondary smelting industry that could be used as a yardstick in determining the validity of the pricing formula in the hot metal contracts. Wakesberg couldn't help him.

Victor Dalmas later brought up the subject of scrap prices with this question:

Dalmas. Our scrap price is too high. Is there anything in the scrap economy that tends to hold these scrap prices above what they should be?

Wakesberg. I think that demand and supply usually determine the price level of anything . . .

Yates. Would you say that was true in primary ingot?

Wakesberg. . . . Unless there are certain controlling situations.

Now, in this hot metal situation, I think there is some kind of a control.

Yates. What do you mean by "control"?

Wakesberg. What I mean is that if a group, as the producers, are large enough to . . . grant this type of discount so as to compete in a discriminatory way with other business, then I would say there is a control.

But if there is no such control . . . and if there is sufficient supply and sufficient demand, you will usually find the general level of prices on the correct level.

Yates. Are you talking about the secondary market, or the primary market?

Wakesberg. The secondary market.

That concluded Wakesberg's testimony, and Yates called the next witness.

Independent Extruders Hurt by Price Squeeze, Mergers, Commodity Prices; Fail in Bid for Hot Metal Contract

Leonard Starr — Aluminum Extruders Council

Final witness of the day was Leonard Starr, representing the Aluminum Extruders Council. Starr's prepared statement and testimony took up more time than those of all the previous witnesses combined. Because of space limitations, we have condensed his statement to bare essentials. Here are the condensed version and Starr's subsequent testimony:

Independent custom extruders are confronted by a price squeeze which appears to be practiced uniformly and concertedly by Alcoa, Reynolds and Kaiser.

Some time before 1951, the Big 3 began to raise published prices of aluminum products so that the spread between 6063 alloy extrusion billet, the principal raw material of custom extruders, and common 6063 extrusions, was narrowed from about 17 cents a pound to as little as 9 cents by 1957.

In contrast, the Big 3 increased their price of common 6063 extrusions by only 10%, while they increased the price of pig by 34%, and billet by 36%.

Since 1955, there has been a further increase, pig now selling for 26 cents a pound and billet for 28 cents, while the price of extrusions set by the Big 3 affords an even smaller margin than in 1955. The price of pig has increased 62.5% since January 1, 1949, while the price of common 6063 extrusions has increased less than 5%.

Commodity Prices Even Lower

But this is the situation when you look at *published* prices; actual prices have been even less. Commodity prices, issued by the Big 3 only to certain classes of customers, are much lower than published prices.

For example, commodity prices for 6063 extrusions to the truck-trailer industry are 4 cents or more a pound below published prices. All extrusions of a given alloy, regardless of difficulty in manufacture, bear the same price. This is not true of the regular price lists of the Big 3.

Independent extruders have also encountered practices by one or more of the Big 3 which result in further price reductions. Members of the Aluminum Extruders Council have reported that some or all of the Big 3 have offered or granted free warehousing at the plants of customers, discriminatory advertising allowances and financing.

Independent extruders, faced by their formidable metal suppliers as competitors, have occasionally lowered prices to counteract losses of business. But no independent non-integrated extruder has the capacity to squeeze—only integrated producers have such power through their control over the price of primary metal.

Subsidize Extrusion Losses

Each of the Big 3 is able to and does offset losses on soft alloy extrusions by profits made in the sale of primary aluminum and the sale of other products.

In this connection, the price of primary aluminum pig is 26 cents a pound in the U. S. market, but Alcoa, Reynolds and Kaiser sell the same metal to foreign buyers at 23¼ cents or less. We have heard no sensible justification for this policy. If competition abroad requires the American primary producers to be competitive, then it must be that we do not have competition in the U. S. If this is so, a remedy is needed.

Recently, 500 tons of aluminum pig were imported into the Miami area from Europe. It was metal which was exported from the U. S. by one of the prime producers; 500 tons of that lot, or perhaps that was the entire lot, was brought back into the U. S. at a saving of over 1 cent a pound to the ultimate consumer.

There is no possible cost justification for the 26-cent U. S. price. In 1949, it cost, in material, power and manufacturing, about 11 cents a pound to produce primary aluminum pig, which was sold for 16 cents. These costs are now about 15 cents and primary aluminum pig sells for 26 cents. Even if 1 cent a pound is added for U. S. freight, this provides a margin of about 60%. This is monopoly pricing aimed at, among other things, the subsidizing of loss operations in soft alloy extrusions.

Mergers Stifle Competition

Another phenomenon has emerged and taken shape as a formidable threat to independent extruders and other independent fabricators. There is a merger movement in the aluminum industry which, unless checked, will eliminate competition and promote greater concentration of market power in a relatively few companies. In recent years, each of the Big 3 has acquired independent fabricators in the U. S.

Action has been taken against Reynolds by the Federal Trade Commission and against Alcoa by the Department of Justice. But there is a strong likelihood that this merger movement will be extended into fields not directly involved in these two litigations.

What it can mean, unless checked promptly at every stage, is illustrated by Alcoa's recent acquisition of Cupples Products, a major window and curtain wall producer and one of Michael Flynn

Mfg. Co.'s major competitors. It is approximately our size, and we have had to reckon with it in almost every instance where we issue quotations to secure business. Now that it is a part of Alcoa it can get its aluminum pig at a vastly cheaper price. With Alcoa's entrenched ability to recommend the specification of aluminum building products, Cupples can enjoy an advantage over independent fabricators. Finally, the multiplicity of Alcoa contacts and business relationships will provide countless opportunities for reciprocal purchasing.

Another phenomenon is simply a loose-knit type of merger which results, in effect, from the financing performed by the prime producers for various fabricators—the extended terms they give them, and the control they thereby have over these companies.

We know of a number of companies to whom the primary producers have extended credit for raw material for inordinately long periods. Some independent fabricators owe prime producers on the order of six months' supply of raw materials.

In one case, the independent fabricator actually has a contract with at least one prime producer—I suspect two—for extended terms. In another case, the fabricator was so close to going out of business that the prime producer sent a host of accounting experts to, so to speak, put his house in order.

It Hurts the Market

The worst thing that happened in connection with this was the harm it did to the market by allowing an intemperate management to proceed without the normal brakes of having to meet a payroll and having to meet the bills for his raw materials.

Yates: Companies like Michael Flynn, do they give the same line of credit?

Starr. Oh, my God, no. We give 30 days, except for those who we think are a credit risk, from whom we ask a deposit and balance sight draft.

The primes often collect interest, or attempt to, for the period over 30 days. But to have contracted with someone for such an extension of credit is to offer him a price advantage on raw material, because he couldn't borrow money at anything like the rate given by the primes. He would have to pay a good bit more.

Without some remedy, the independent extruders are in a hopeless situation. They cannot break the price squeeze, cannot get a hot metal contract, cannot become a primary producer because it takes $100,000,000 or more, and they face the threat of hopelessly unequal competition as the Big 3 acquire more independent fabricators.

Starr concluded with the assertion that "there is a clear need for more enforcement or more legislation to preserve the independent extruder."

The question period that followed ranged over a wide assortment of subjects, but Yates first wanted to know if the abuses described were confined to the Big 3. Starr replied that they apply to other producers—"or at least to one of them." He went on to describe a situation in which a primary producer carries an inventory of shapes for certain customers.

The inventory in this case is stored in the customer's plant. As the customer draws material from inventory he notifies the producer and is invoiced. What's more, according to Starr, the producer pays the inventory tax, if any, "which could be quite a few thousand dollars."

Starr described another example in which the primary producer grants a special price concession to a customer who agrees to consume a certain quantity of one shape within a certain period of time. In this case, the producer extrudes the entire order and warehouses it for the customer.

Big Users Get Extended Credit

When the witness brought up the subject of extended payment terms referred to in his statement, Yates asked him how the producers select customers that receive such benefits. Here's Starr's answer and ensuing testimony.

Starr. Particular companies that use a lot of aluminum and are very short on money. In other words, this is a means of promoting a sale of a large quantity of aluminum. No self-respecting company would entertain such a suggestion.

Yates. Would you entertain that kind of a suggestion?

Leonard Starr
"Some independent fabricators owe prime producers for six months" supply of raw materials."

Starr. Suggestions that terms be extended for payment of raw materials? I think Mr. Frank Flynn would dismiss me categorically if I, in my position as vice president and controller of Michael Flynn Mfg. Co., accepted payment for raw materials on the basis of say 120 days with interest of 6% for the 90 days over the normal time.

Yates. Suppose this becomes a pattern of the industry.

Starr. We could not afford to extend those terms.

Yates. Is this true of other members?

Starr. Yes. I know of no independent, off-hand, who could afford to meet that kind of competition.

'But We Have the Order'

Yates. What about other benefits?

Starr. Well, we ran into one that would be almost funny if it weren't so tragic.

We had a sale of aluminum extrusions which to us was quite a large order—about 800,000 pounds. That might be something like $400,000. This sale was to Ward LaFrance for shipping containers that they put on ships and railroad flatcars.

Ward LaFrance is associated with Highway Trailer Co., a major customer of ours. We had the written order acknowledged, and started work on it.

We got a request from Ward LaFrance that Alcoa would like 50% of the order. We said: "We have the order . . . we have a contract." They said: "Please look into it. We are very anxious to give Alcoa 50% of the order." We asked why.

Well, it seems Ward LaFrance is making these containers for Container Ships Inc., which is associated with Maryland Shipbuilding Co., which does repair work on Alcoa ships.

Yates. Have your associates in the Extruders Council encountered similar difficulties?

Starr. Yes, definitely. We cited many specific cases in the complaint we sent to the Department of Justice in February 1958—instances of financing, advertising, warehousing for fabricators.

Yates. Has the Department of Justice been in touch with you?

Starr. Yes. Initially we had quite a number of meetings with them, but for eight or nine months there have not been any meetings. Frankly, I don't know where this stands in the Department of Justice right now.

Yates. Have any of your members gone out of business?

Starr. A few have gone out of business. Quite a number have lost money.

Yates. Is that because it was a soft year for the extrusion business?

Starr. It was a fairly soft year, although it didn't suffer as much as sheet,

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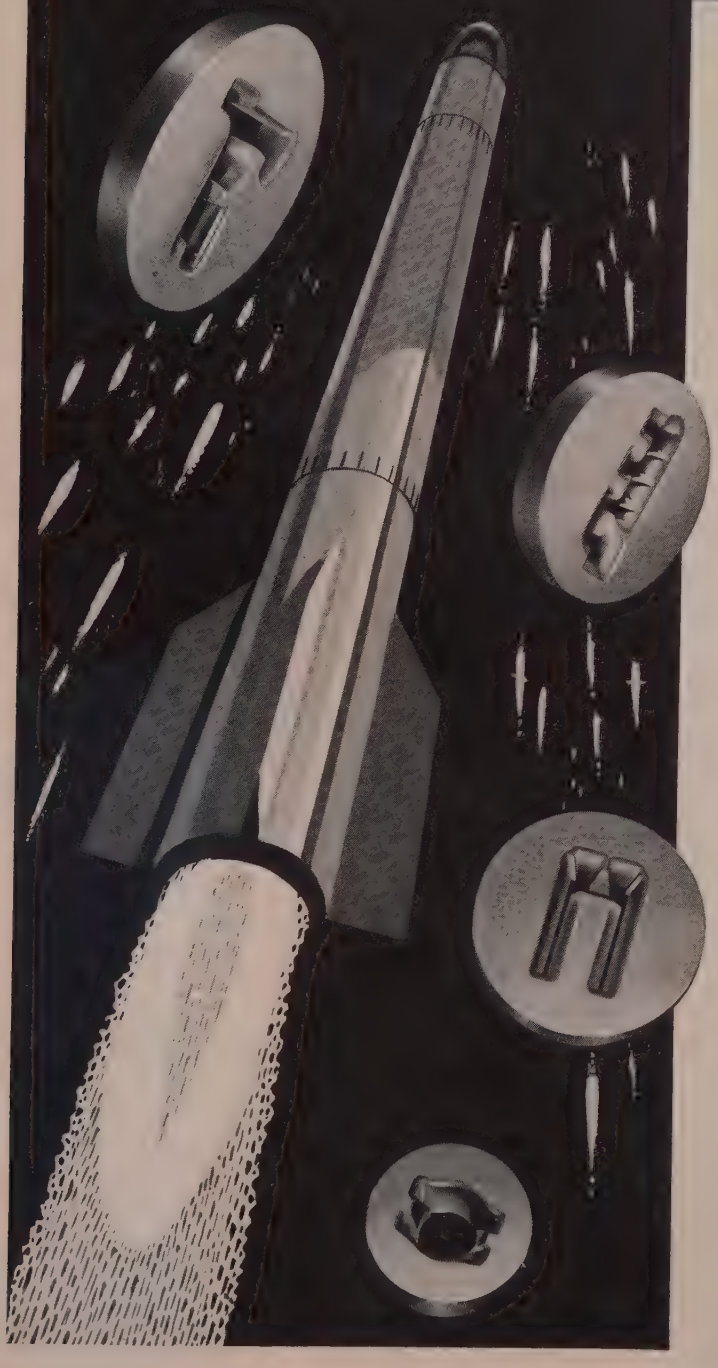

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for instance. But it was a difficult year for extruders, mainly because the price squeeze was being intensified all year.

Yates. I note your statement about the Big 3 selling primary metal to foreign buyers at 23¼ cents or less. You say: "We have heard no sensible justification for this policy."

The reason given me in outside discussions is that this price is necessary in order to crack the foreign market.

'No Competition Here'

Starr. In our statement we pointed out that if they have to accept foreign competition and sell at 23¼ cents . . . and if the price is 26 cents a pound here, then you can only conclude that there is no competition here.

Now, that 23¼ cent price is subject to ocean freight, commissions, and often to inland freight in, say, Europe. Ocean freight is roughly a cent a pound. Commission is roughly a half-cent.

It brings the price down to, say, 22 cents a pound, delivered New York Port of Shipment, compared to 26 cents if you are an extruder in, say, Long Island buying from a domestic producer.

Now, I don't know what sort of trend this indicates, but in February the U. S. exported 42,548 tons of crude aluminum. If that is any criterion of what is going to be exported, that is at a rate equal to 25% of our actual primary production.

It is hard for me to see how 25% of our primary production can go at something like 22 cents at the Port of New York and 75% at 26 cents a pound for the rest of the country.

Furthermore, we have a duty on aluminum. Just what is this duty protecting if we export 25% of our supply?

Yates. If you can buy aluminum for 23.5 cents from a foreign supplier, why don't you do it?

Starr. I think the price is somewhat higher. Most imported aluminum, other than the Canadian source, is between 24 and 24.5 cents a pound. And it is being bought. Most of the foreign aluminum we buy, other than Canadian, comes from Norway.

Yates. What price do you pay?

Starr. 24.2 cents delivered Port of Philadelphia. It costs us about a tenth of a cent to bring it in, so you might say our cost is 24.3 cents a pound, or 1.7 cents under the domestic price.

Yates. Does this include tariff?

Starr. Yes. The 24.2 is after payment of the tariff of 1¼ cents. The Norwegians pay the tariff, and there is commission, ocean freight, and everything else.

Yates. Your statement says:

"In 1949 it cost, in material, power and manufacturing costs, about 11 cents a pound to produce primary aluminum pig, which was sold for 16 cents in the U. S. These costs are now about 15 cents a pound and primary aluminum pig sells for 26 cents a pound . . ."

How do you know those costs?

Starr. Our primary source of information is the 1956 report of your committee.

Yates. As I remember, the report of our committee . . . indicated what the mill costs were up to 1956. Where do you get your computations for the present time?

Starr. The 15 cents comes two ways. One is an extension of bringing up to date the figures in your report, though I had best put it this way:

I don't know of an extruder . . . who has not investigated the cost of primary pig, of making it himself or with some others. If this price squeeze is the case, as we have stated, one of the areas of relief is to make your own aluminum.

'A One-Pot Potline'

So practically every aluminum extruder I know has at times investigated the cost of making aluminum pig. In fact there is an extruder in Seattle who has a pot in which he is making aluminum. I never heard of a one-pot pot line, but he has one. I imagine he buys power from his local power company. I know he went to Europe to check into the means of making aluminum on a small scale.

Yates. Is this one of your members?

Starr. No, but he has an extrusion press.

Yates. He is not integrated?

Starr. He is not an unintegrated fabricator any more. He is integrated. I don't think the one pot makes nearly enough for his requirements. I understand he gets about 3,000 pounds a day. He probably uses several times that.

Yates. What does he do for bauxite?

Starr. I imagine he buys alumina, maybe from Japan, like Harvey does.

The point is, all independents are anxious to make pig if they could. They can't because of the financing it takes. But the knowledge of what it costs to make pig is far from an occult secret.

At about this point, the discussion turned to the position of independent fabricators in various mill product fields. Starr read some Department of Commerce figures showing that in 1957, independent firms accounted for 10.1% of total sheet and plate volume, 24.5% of foil, 47.9% of wire and covered cable, 39.3% of ACSR and bare cable, and 61% of the total output of extruded shapes and drawn tube.

He also noted that between 1950 and '57, independent extruders' total volume had grown 312.8%, while independents' growth in the other categories was considerably less — 194.8% in sheet and plate, 62.3% in foil, 78.7% in wire and covered cable, 120.5% in ACSR and bare cable.

In response to a question, Starr further pointed out that the independent extruders' share of the market slipped to 55.5% in 1958 and to 54.4% in 1959. Yates wanted to know what caused this. Starr conceded that some of the decline was due to absorption of independents by producers or independents becoming producers as in the case of Harvey, Olin, Revere and Anaconda.

But he attributed the major part of the loss to "the fact that the primary producers have squeezed the margin between the selling price of extrusions and the cost of pig to such a low level that in many cases the primary producer could take an order where the independent extruder could not . . . without a major loss."

Yates asked if the witness based that evaluation on his own experience. "No," said Starr. "This is based on figures collected by the Aluminum Extruders Council and Ernst & Ernst as a result of surveys among extruders."

The surveys showed, he said, that extruders' profit averaged 2.7% of sales in 1955, 2.2% in 1956, 1.8% in 1957, and 3.0% in 1958. He didn't have figures for '59, but felt sure that the average profit was less than 2% — which is less than half that of manufacturing companies as a whole.

"What portion of that may be attributable to increased labor costs?" asked Yates. Here's Starr's reply.

Starr. No more than is the case with other manufacturing companies.

Yates. Is your primary cost labor or the price of raw material?

Starr. Absolutely raw material. Take an extrusion that sells for 40 cents a pound. Pig sells at 26 cents. In other words, our raw material cost at its cheapest form, pig, is 65% of the selling price. And from the balance of 35% we have to pay for our equipment, maintenance, supplies, labor, administrative cost, sales cost and profit.

'A Hot Metal Deal?'

Yates then asked if Starr had "explored the possibility of a hot metal deal." Here's Starr's reply:

Starr. Oh, my, yes.

Yates. Tell us the facts.

Starr. With pleasure. I would like to say just one thing first: If we had a hot metal contract similar to those I read, and we had a plant adjacent to the potline, and we made our pig or billet there and shipped it to Philadelphia, we would end up with pig and billet more than 10% cheaper than the

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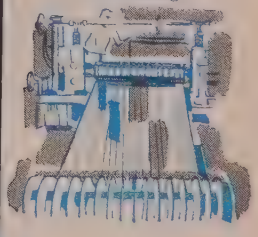

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domestic published price.

Yates. Why?

Starr. Because the price for hot metal, as expressed in those contracts, is a real price advantage.

Yates. Would this be true of other members of your association?

Starr. Absolutely. Now, Congressman, we try to get a —

Yates. Wait a minute. Let me ask another question. Is the sum total of all the billet purchased by your members more than the amount that Reynolds supplies to General Motors or Ford?

Starr. I would say it is much more.

'Hot Metal Not Available'

Yates. Why don't you take the suggestion of the Committee's first report and pool your needs and try to get a contract from Reynolds or Alcoa . . .

Starr. A hot metal contract was not available to us . . .

Yates. Not available to you? As I remember the testimony it was available to anybody who wanted hot metal.

Starr. Well, we wrote to Reynolds on October 29, 1958, and asked them for a hot metal contract. We got this reply November 26, 1958: "We have not yet made a decision. We will keep your inquiry in mind as the matter is being considered." Signed by Earnest Shaw, Regional General Manager, Southern Region.

We wrote again December 23, 1958, reminding them of their letter of November 26. Reply, January 15, 1959: "Thank you for your letter of December 23. Matter is receiving continuing consideration."

Yates. Who signed that?

Starr. Earnest W. Shaw, Vice President. Same man, different title.

Yates. He had been promoted?

Starr. Yes. He is doing good. I will make him president yet.

January 16, 1959 we wrote: "I have your letter of January 15th with respect to molten metal. It seems likely that no decision will be made by your company in the near future and, of course, we will have to guide ourselves accordingly. Please advise if we are not correct."

February 13, 1959 reply from Shaw: "I am not able to say that it seems likely that no decision will be made by our company in the near future."

Yates. Was he able to say anything?

Starr. I will read the rest. "With the exception of the automotive companies, no one seemed to have any interest in molten metal, only until recently. Your letter is one indication of customer interest and is naturally being considered along with other factors. I do not know when we will reach a decision, but I assure you that the matter is under consideration."

My next letter was to the Department of Justice enclosing copies of the correspondence on March 11.

Yates. Did you send a copy of that to Mr. Shaw?

Starr. No. And then I got a reply from Justice on March 20th acknowledging the correspondence and advising that it had been referred to the FTC. We checked verbally with both Justice and the FTC. As far as we know, nothing has happened.

Yates. Was it a bona fide inquiry on your part for hot metal?

Starr. Oh, my God. We would have given our right arm to be able to do it. We were subject to a price squeeze. If we could save 10% on raw materials, that was several times our profit.

Dalmas. Did you and the other members of your Association increase prices towards the end of 1959 after the increase in pig price?

Starr. We published a revised price list increasing the prices of the extrusions. So did every other independent producer I know of. Today, the prices of extrusions are lower than they were before the increase in pig.

I might add that the reason extrusions did not increase in price is because two of the prime producers went around to preferred customers who bought interesting amounts of extrusions and indicated that they would hold the price for the first quarter of 1960 before they increased extrusion prices in accordance with the pig increase.

Dalmas. Now, all of the aluminum companies have a regular price book which is changed periodically, maybe day by day. Are you saying that the aluminum companies have two price books?

Starr. I have been told by a representative of the prime producers, who was a product manager, that his company had commodity price lists covering thousands of different items. These are not listed in the regular price books. . . .

Dalmas. Are you implying that those prices are (lower than) published prices?

Starr. Yes.

Yates. He isn't implying that. He is saying it. How do you know this?

Starr. I could give an example.

There was a case of an extruder in Cincinnati, having only one press, who quoted a truck trailer manufacturer some reduced price for 6063 extrusions. Alcoa heard about this, and shortly thereafter issued a commodity price meeting this particular competition, of this particular extruder, to this particular customer, and issued that price on a nationwide basis to all truck trailer manufacturers.

For the next several minutes, both Victor Dalmas and Congressman Multer tried to get a more precise definition of the term "price squeeze." The only new angle that came out of it was Leonard Starr's analogy between the independent aluminum extruders of today and the independent rollers of steel shapes back in the '20's.

There were "over a hundred" of these small steel rollers back then, he explained, but today only "half a dozen . . . all captive . . . making highly special items for manufacturers of finished goods" are in business. He attributed this shrinking of the industry to a price squeeze between high ingot prices and low rolled shape prices.

"We can see the identical thing . . . happening to the independent aluminum extruders," Starr declared.

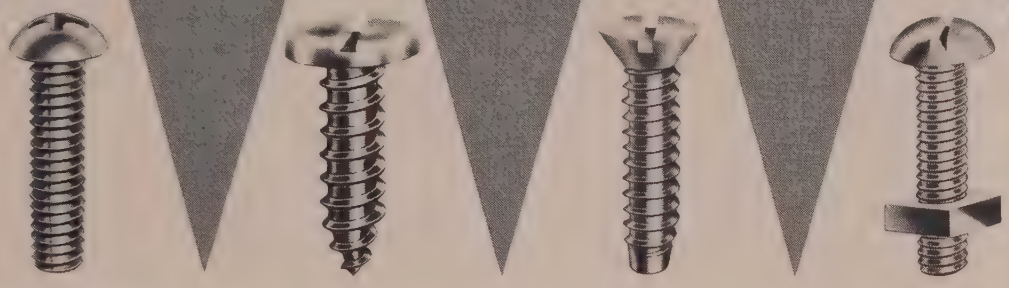
In reply to a question, he assured Multer that members of the Extruders Council would be willing to swear under oath that the abuses cited by Starr actually happened. This prompted Multer to observe that "to me (the abuses) would be a violation of the law. I think you agree we don't need any amendment to the law. We need better prosecution. Isn't that so?"

Starr agreed "because to implement new laws is going to be a time consuming period. We are hurting. We would like to think that this committee, together with the Justice Department and the FTC, can find the solution . . ."

That ended Starr's testimony and the day's proceedings.

***To be continued* . . . Part 2 of this special Modern Metals report will include the testimony of the following witnesses:**

E. H. Weder — Highland Supply Corp.
R. A. Domar — U. S. Aluminum Siding Co.
Harry Sugar — Alsco, Inc.
W. A. Edwards — U. S. Department of Commerce
J. H. McConnell — Reynolds Metals Co.
M. F. Garwood — Chrysler Corp.
S. E. Skinner — General Motors Corp.
L. P. Favorite — Aluminum Co. of America
J. L. Cameron — Ford Motor Co.
D. A. Rhoades — Kaiser Aluminum & Chemical Corp.



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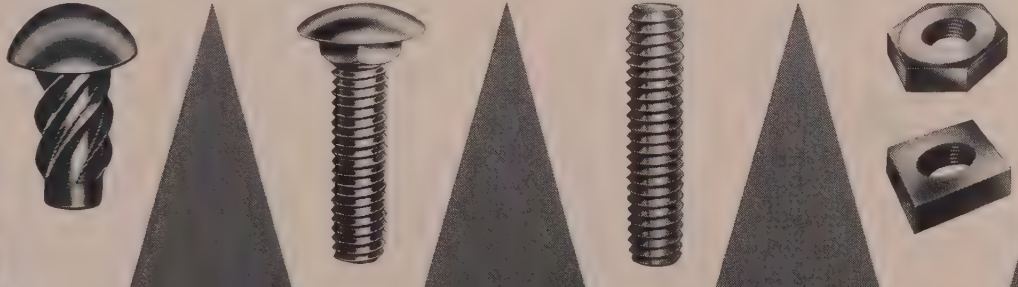

Welding Aluminum

Part 2: The Tungsten-Inert-Gas Process

This segment of MODERN METALS' *series covers manual and machine tungsten-inert-gas (TIG) welding. Application, torch manipulation, possible welding difficulties, theories on oxide removal and other facets of the method are detailed. Next month, the metal-inert-gas (MIG) process will be explained.*

Based on information supplied by Aluminium Laboratories Limited, Research Division of Aluminium Limited

Argon tungsten arc (TIG) welding is usually used on aluminum between 0.020 and 0.375 inch thick. It produces bright, clean, high quality welds that require no cleaning and little, if any, finishing. It can be used to make all-position manual welds, and for machine welding without a filler.

TIG welding uses an alternating current electric arc maintained between a nonconsumable tungsten electrode and the aluminum workpiece in an argon gas atmosphere. If filler metal is used, it is usually added manually. The complete absence of fluxes is possible because the arc, in argon gas under proper conditions, removes the oxide film while the gas shield prevents its reformation.

TIG welding can be used on all fusion weldable aluminum alloys. If properly done, welds have a sounder structure than those made by other processes.

Other advantages are high welding speeds, excellent penetration on butt joints, little weld distortion on most assemblies, and low welding costs due to the high production rates plus the fact that any filler needed is standard bare welding wire or rod, which costs less than flux coated or special fillers.

Dissimilar aluminum alloys can be TIG welded, but the closer the composition and weldability of the two, the easier they are to join.

TIG Equipment Includes . . .

Aluminum can also be welded to copper, steel and other metals, though the special techniques and procedures necessary must be sought from aluminum suppliers and welding distributors.

To produce sound TIG welds it is necessary to have suitable equipment, properly designed and installed. Otherwise, weld quality will suffer and costs will soar. Basic TIG equipment includes:

1. A-C welding transformer with open circuit voltage of not less than 80 volts.
2. High frequency generator.
3. Welding torch fitted with cables and leads for power, shielding gas and coolant.
4. Argon pressure regulator and flowmeter.

Accessories may include:

1. A control panel which automatically starts and stops electrical power, coolant and shielding gas.
2. Power factor correction condensers.
3. Self-polarizing electrolytic clocking condensers and/or a battery bias.

The transformer, generator and control panel are often combined to form "packaged power" units.

Watch These Variables

Choice of welding equipment depends on variables such as amount of welding to be done, weld quality required, alloys and thicknesses to be welded, equipment on hand. Many times conventional a-c welders, if equipped with a high frequency unit and a battery bias, are suitable for average TIG welding, especially in the flat position.

When quality or quantity requires improved operation, specially designed TIG equipment should be used — particularly when operating near the limits of the process or when high reliability is required.

Single phase a-c welding transformers should be smoothly adjustable through the whole range of welding current. They should have an open circuit voltage of 80 volts minimum, 100 volts maximum. Power factor correction capacitors are usually required by the power supply company.

While a high power factor is beneficial as far as the power supply is concerned, it is detrimental to arc stability and necessitates a compromise. The operating factor for TIG welding is usually higher than that for which the machine is rated since such ratings are usually based on steel. Because of this, fan-cooled welders are preferred.

Battery Bias Preferred

Arc rectification, which may cause overheating of the transformer, can be eliminated by using electrolytic blocking capacitors of a battery bias connected in series with the welding circuit. The battery bias is preferred because it also assists in stabilizing the arc.

One battery should be used for each 100 to 150 amperes of welding current. The battery should be connected in parallel with the positive terminals in the direction of the electrode. Direct current (d-c) welders (reverse polarity, electrode positive) may be used for welding material under 0.051 inch thick.

To assist starting and stabilizing the arc a high frequency unit superimposes, through an air coupler, high-voltage, high-frequency power on the welding circuit. Units are usually of the spark-gap type and should have ample capacity to arc through argon from a cold electrode across a 1/16-inch gap with a white bushy cone.

In a typical high frequency unit a spark-gap of 0.004 inch on each of the two gaps in series is usually ample and will result in a low level of radio interference when used with short torch

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leads, good grounding, and a by-pass.

(Because of the high voltage involved the high frequency unit should be shut off before changing electrodes or repairing the machine.)

When welding over a large area it is more efficient to have a portable high frequency unit, automatic controls, and torch. Long leads, connecting the transformer with the high frequency unit and automatic controls, permit the use of short torch leads which minimize the loss of high frequency current.

Gas Must Flow Until . . .

Argon must flow during welding and after the arc is broken until the electrode cools below its oxidation point. Manual control of argon is wasteful. Automatic control of gas, power, coolant and welding current saves argon, prevents condensation in the torch, and renders the torch "dead" when not in use.

Torches come in various sizes to suit light, medium and heavy duty operations. Light duty torches are usually fitted with ceramic cups; medium and heavy duty torches have durable metal water-cooled cups which allow higher currents to be used.

High quality tungsten and zirconium-tungsten electrodes range from 0.040 to 0.375 inch in diameter. The latter can carry high current and may permit the welding of thick material without using a larger torch. Zirconium-tungsten electrodes are less susceptible to contamination by molten aluminum and have a longer life than pure tungsten electrodes. Thoriated tungsten electrodes are not suitable for aluminum because of their unstable arc and tendency to contaminate the weld.

Welding grade argon is available commercially in pressure cylinders. A pressure regulator, flowmeter, shut-off valve and connecting hose should be used with the cylinders. Argon must not be contaminated by water vapor or other foreign material such as talc dust found in new hose. The entire gas system must be as clean as possible.

Coolant can be any reasonably pure water supplied at a relatively uniform temperature and a pressure of 20 to 50 psi. Water should be filtered and, if city water, passed through a pressure reducing valve to bring pressure within required limits. Closed systems are available which cool and recirculate water and reduce the number and length of lines needed. Permanent automobile anti-freeze can be used when welding at below freezing temperatures.

Which Filler Alloy?

The parent metal alloy usually governs the choice of the filler alloy. An incorrect filler alloy can cause weld cracking, low strength, poor corrosion resistance, poor color match and difficult welding. Table 1 shows preferred and alternative alloys for use with any wrought parent metal.

Selection of a filler for welding castings is governed by the casting alloy. Generally, the filler should be of the same alloy as the casting. (If the proper filler alloy is not available, consult your aluminum supplier.)

All welding wire and electrodes should be stored in a clean, dry atmosphere with the temperature controlled as uniformly as possible between 65° and 80° F.

What Removes Oxide?

To understand how oxide is removed when TIG welding aluminum it is necessary to know what happens in the arc. An electric arc is a passage of electric current through a gas. The gas is ionized, and the electrons travel from the negative to the positive poles of the arc while the positively charged ions move from the positive to the negative poles. In reverse polarity welding, the electrons travel from the workpiece to the electrode while the ions travel from the electrode to the workpiece.

While there is some disagreement as to what causes cleaning, it is a fact that such cleaning only takes place during reverse polarity welding — not with straight polarity welding. Two theories try to explain oxide removal.

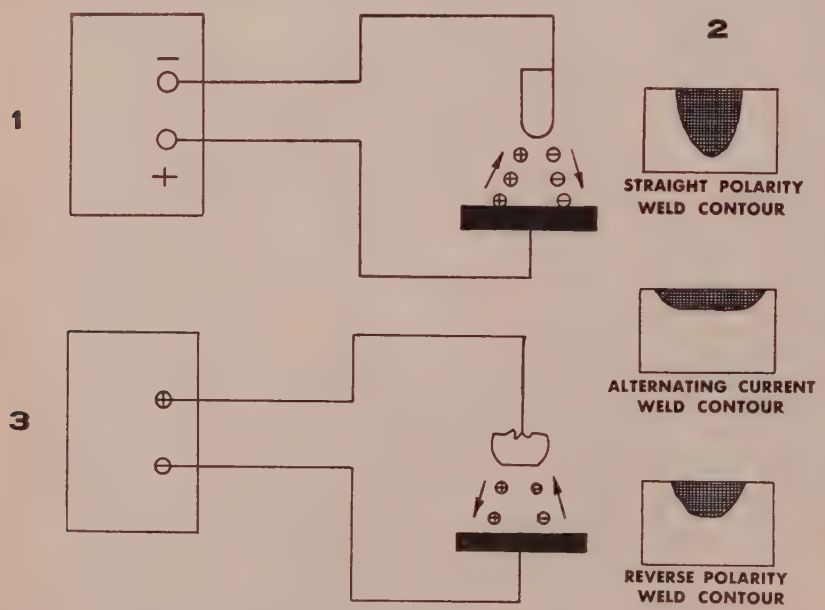
One suggests that the oxide film is broken up by the electrons as they leave the surface of the aluminum during the reverse polarity half of the cycle. The other belief is that oxide is removed during the bombardment of the work surface by the positively charged gas ions. (This can be compared to sand blasting which breaks up the oxide film and allows the melted metal to coalesce.)

In d-c straight polarity welding, the electrode is connected to the negative terminal of the welding generator and the work to the positive terminal (see Fig. 1), with electron flow from electrode to work. Positively charged gas ions flow from the work to the electrode. In this case the gas is only a shield and conductor of the arc current.

The contour of the weld produced by d-c straight polarity is deep and narrow (see Fig. 2). Heat liberated by the arc is concentrated in the workpiece (there is relatively little heating of the electrode). When using d-c straight polarity, a 1/16-inch diameter electrode will carry a welding current of approximately 125 amperes. This method is not recommended for aluminum since no oxide is removed.

In d-c welding with reverse polarity the electrode is connected to the positive terminal of the generator, the workpiece to the negative terminal. Electron flow is from work to electrode (Fig. 3). A ¼-inch electrode will carry 125 amperes since much heat is concentrated in the electrode. The contour of the weld is shallow and broad (see Fig. 2). The gas shield also removes the oxide.

Welding with d-c, reverse polarity is usually recommended for very light gauge material because of the large electrode required to carry the necessary current. The arc length required for aluminum is so short that it is difficult to maintain this clearance with-



■ ***Figure 1 diagrams d-c straight polarity welding. Electrode is connected to negative (—) terminal of welding generator and work to positive (+) terminal. Figure 2 shows various weld contours resulting from different currents. Figure 3 diagrams reverse polarity, with electrode connected to positive terminal, work to negative.***

TABLE 1: Recommended Filler Alloys for TIG and MIG Welding and Torch Brazing

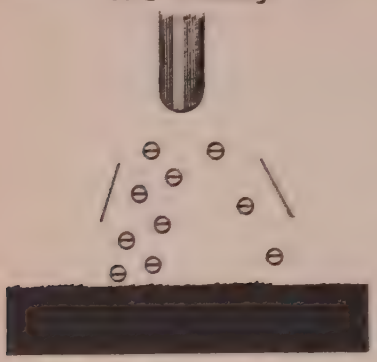
Preferred Filler Alloy (Weldability) 1 Ease 2 Strength 3 Freedom from defects	Second Choice Filler Alloy (Weldability)
Preferred Filler Alloy where resistance to chemical attack governs	Torch Brazing Filler Alloy if brazing recommended

LEGEND

Parent Metal Alloy ▶	AA1060	1100	3003 or 3003 Alclad	6063	6101	6351	5454	5154	Al+Mg 4.4%	5056	5052	AA6061 or 6061 Alclad
AA1060	(4) 4043 | 1060 — 1260 | 4047											
1100	4043 | 1100 — 1100 | 4047	4043 | 1100 — 1100 | 4047										
3003 or 3003 Alclad	4043 | 1100 — 1100 | 4047	4043 | 1100 — 1100 | 4047	(3) 4043 | 1100 — 1100 | 4047									
6063	4043 | 5356 5254 — 4043 | 4047	4043 | 5356 5254 — 4043 | 4047	4043 | 5356 5254 — 4043 | 4047	(2)(5) 4043 | 5356 5254 — 4043 | 4047								
6101	4043 | 5356 5254 — 4043 | 4047	4043 | 5356 5254 — 4043 | 4047	4043 | 5056 5254 — 4043 | 4047	(5) 4043 | 5356 5254 — 4043 | 4047	(5) 4043 | 5356 5254 — 4043 | 4047							
6351	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	(3) 4043 | 5356 5254 — 4043 | (6)						
5454	5356 | 5254 — 5554 | -	5356 | 5254 — 5554 | -	5356 | 5254 — 5554 | -	5356 | 5254 — 5554 | -	5356 | 5254 — 5554 | -	5356 | 5254 — 5554 | -	5554 | 5356 — 5554 | -					
5154	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	(1)(3) 5356 | 5254 — 5254 | -				
B54S Al+Mg 4.4%	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5356 | -	5356 | 5254 — 5356 | -	5356 | - — 5356 | -			
5056	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5356 | -	5356 | 5254 — 5356 | -	5356 | - — 5356 | -	5356 | - — 5356 | -		
5052	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | (6)	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | (6)	
AA6061 or 6061 Alclad	4043 | 5356 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	4043 | 5356 5254 — 4043 | (6)	5356 | 5254 — 5254 | -	5356 | 5254 — 5254 | -	5356 | 5254 — 5356 | -	5356 | 5254 — 5356 | -	5356 | 5254 — 5254 | (6)	(5) 4043 | 5356 5254 — 4043 | (6)

NOTES:
(1) 5254 alloy required in unfired pressure vessels built to ASME code.
(2) 5356 alloy results in improved colour match after anodizing.
(3) 5254 alloy preferred for pipe welding.
(4) 4043 alloy should be used for electrical connections.
(5) 4047 alloy may be necessary in some parent metal combinations to reduce hot short cracking.
(6) Difficult to torch braze.

Fig. 4—Uneven Flow of Current in A-C Welding



[illegible] welding the aluminum tip

[illegible] welding of aluminum is not recommended, except for very light material, when both polarity pictured only a few of the necessary requirements. But when the two polarities are used together as in a welding, the desirable characteristics of each produce suitable conditions for welding aluminum.

As arc welding the polarity of the electrode and the workpiece change [illegible] times per second. Thus the contour of the weld is between the narrow, deep type produced by straight polarity and the broad, shallow type produced by reverse polarity (see Fig. 2).

Electrode heating is [illegible] between that produced by each polarity. In welding with 1/8" electrode a 3/32 inch diameter electrode is sufficient to withstand welding. Choosing a size of tungsten [illegible] heavy duty to handle power [illegible] welding and is sufficient to remove oxide from the aluminum surface.

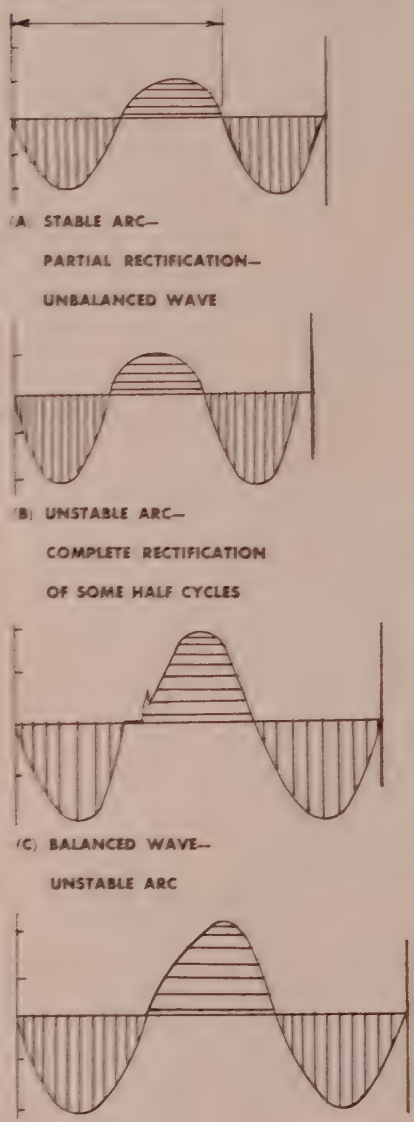
But using a.c introduces another problem—rectifying the arc. Since the current drops to zero and reverses direction twice in each complete cycle, there must be some means of starting the arc again after it has been extinguished. There are two methods: (1) Using a transformer that has a high open-circuit voltage; or (2) using a high-frequency high-voltage current that can be superimposed on the regular welding current.

The first method will re-establish the arc after the current drops to zero, but it is a hazard to the operator. In the second method, generally used today, the high-frequency discharge serves to ionize the air gap and provides a ready path for the flow of current.

In an inert atmosphere an arc between a tungsten electrode and aluminum has greater resistance to current flow when the electrode is positive than when it is negative (see Fig. 4). This unequal resistance in the alternating current cycle produces an unbalanced wave (see Fig. 5A).

The unbalanced wave may be considered a regular a-c wave with a d-c component. If the method of stabilization is not fully satisfactory an arc may be maintained with only occasional loss of the entire reverse polarity portion of the cycle (see Fig. 5B).

The amount of rectification in aluminum welding varies greatly with the type and efficiency of the electrical equipment. When using welding transformers which have open-circuit voltages of less than 75 volts, and inefficient high-frequency units, anything from partial to complete rectification may be encountered. Thus, the open circuit voltage of the transformer should be close to 100 volts. Even with this high open-circuit voltage partial rectification in the arc is possible. The adverse effect of this can be overcome by inserting a battery bias or capacitors in the circuit to balance the wave.



■ *Figure 5 shows what happens with various types of arcs. "A" shows how stable arc with partial rectification produces an unbalanced wave. "B" shows an unstable arc with complete rectification of some half cycles. "C" is balanced wave with unstable arc; "D" is a balanced wave with stable arc. Smooth arc of "D" can be obtained only when a battery bias is used.*

Under some circumstances (Fig. 5C), the capacitors may not provide on each half cycle an arc as smooth and stable as illustrated in Figure 5D. This is obtained only with the battery bias, which is recommended if a smooth arc and good control are essential.

Storage batteries used should be of the six-volt variety, but need not be new. Batteries which are no longer satisfactory in an automobile may be quite satisfactory for TIG welding.

It is not difficult to recognize an arc where a large amount of rectification is present. The arc is erratic and gives off a characteristic snapping noise. Also, when filler is being added, some of the molten filler will not fuse with the puddle but will be blown out.

General pre-weld considerations, such as selection of type of joint, edge preparation, surface and joint cleaning, joint spacing, jigging and pre-heating apply to TIG welding just as they do to other welding processes. Specific recommendations on these pre-welding operations for each job can be had from the major metal suppliers and welding equipment manufacturers.

It is essential that the electrode tip remain molten and hemispherical in shape during welding. Because of this the electrode diameter must suit the welding current, since for a given size there is a limited welding current range (see Table 2).

Electrodes that are too small become too fluid at the tip. Drops of tungsten fall into the weld puddle, contaminating the work. Also, a fluid tip causes an unstable arc. Frequently, it is best to select an electrode one size larger than recommended and taper it by grinding to that size at which the end will be molten. This is particularly needed when operating near the electrode's current limit.

Torches with water-cooled cups enable electrodes to be used at the upper limit of their range. Consumption of the electrode is negligible under normal welding conditions.

The electrode should be concentric

TABLE 2

Tungsten Electrode Operating Ranges

Electrode Diameter	Welding Current in Amperes	
Inches	Pure Tungsten	Zirconium-Tungsten
1/16	Min to 65	Min to 70
5/32	65 to 150	65 to 160
1/8	150 to 175	150 to 185
3/16	175 to 275	175 to 300
1/4	275 to 400	275 to 430
5/16	400 to 550	— —

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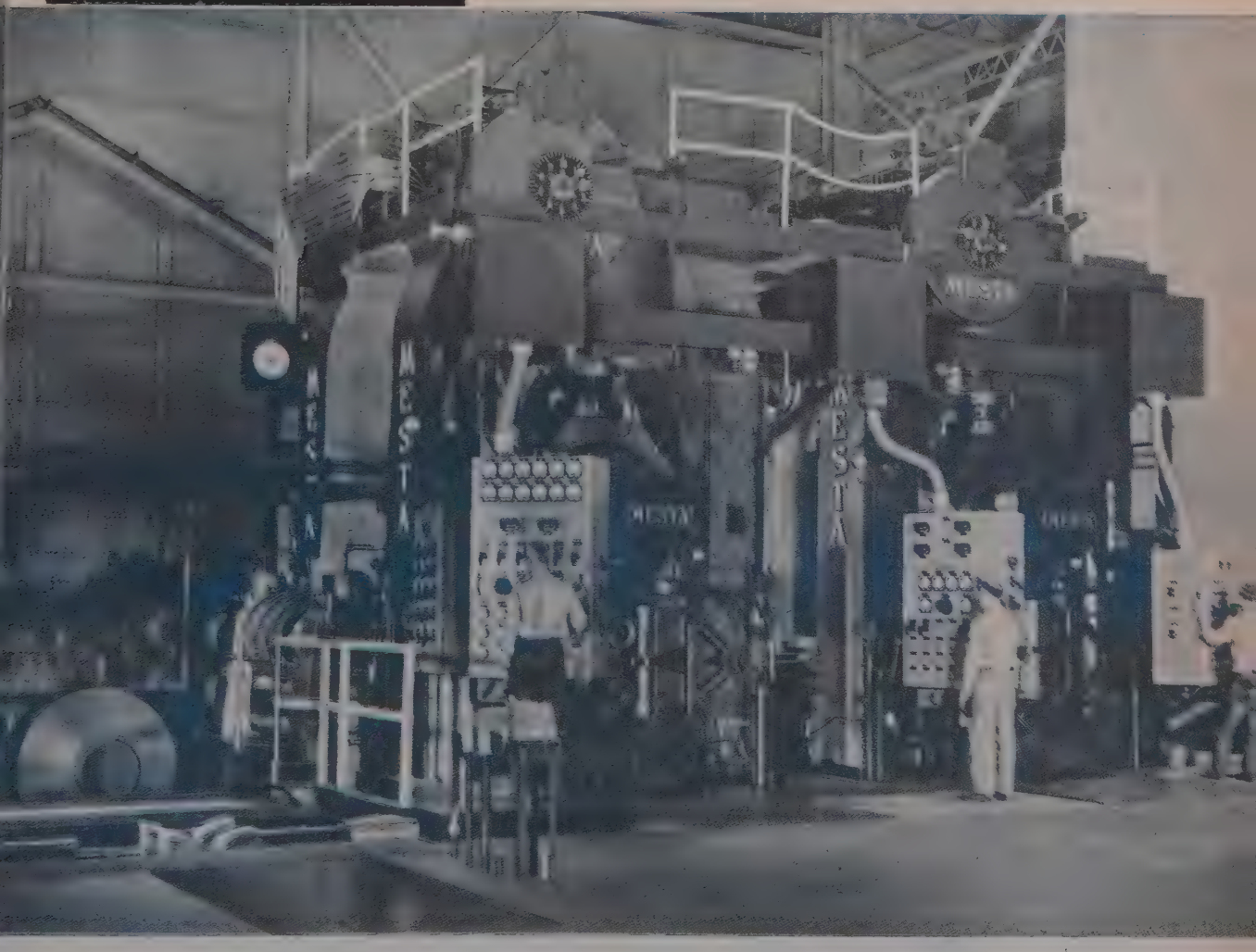

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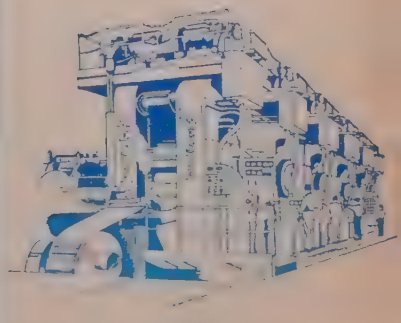
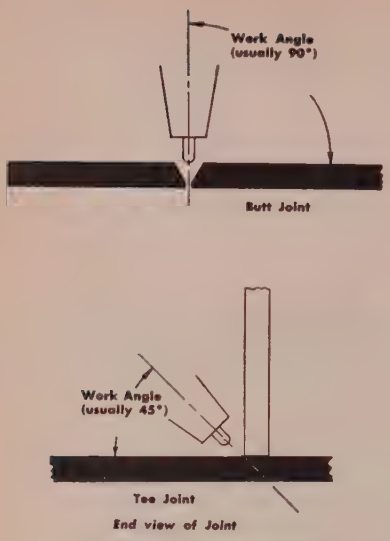
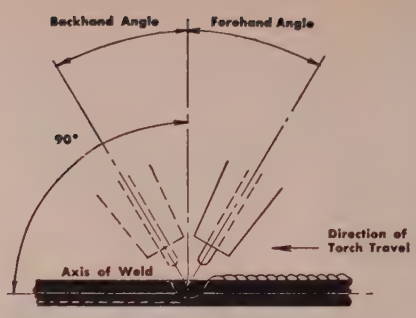




WORK ANGLES FOR BUTT AND TEE JOINTS



FOREHAND AND BACKHAND ANGLES

■ *Figure 6 shows various angles at which torch should be held when welding butt and tee joints. Diagram at upper left shows angle for butt welding in flat position. Work angle for tee joint is shown at bottom left. Torch should be placed at 45 degrees and bisect angle of two work pieces. Forehand and backhand angles for butt welding are shown above.*

with the cup and should protrude approximately ⅛ inch. For difficult locations or fillet welds it may be desirable to have the electrode protrude slightly more, accompanied by a small increase in argon flow.

To Salvage Electrodes . . .

The hot electrode can become contaminated with aluminum if it touches the filler wire or the work. This will cause a dirty, sputtering arc which will not produce clean, satisfactory welds. It disrupts the arc and prevents proper removal of oxide. There are three ways to salvage contaminated electrodes:

1. Increase current (up to 50%) and strike the arc on a piece of scrap material. When the end of the electrode is molten break the arc and flip the torch to shake off the contaminated portion. Next, reduce welding current to normal, strike the arc on a piece of scrap and maintain it until a clean weld puddle is obtained.

2. If method 1 is not effective, remove the electrode, grind off the contaminated portion, replace it and strike an arc on a piece of scrap and maintain it until the proper contour is obtained on the tip and a clean puddle forms.

3. If these methods don't work remove the electrode, *break* off the contaminated portion, strike the arc on a piece of scrap and maintain it until the proper tip contour is obtained.

Gas cup sizes, current settings, and gas flow rates should be decided upon after consulting suppliers, explaining the job and the materials used.

After completing all pre-welding steps, work can begin. The arc is started directly in the joint by swinging the torch with a pendulum-like motion until the electrode is close enough to the work to permit the high frequency current to arc to the aluminum and establish a path for the current. A good arc will have directional stability with a smooth humming sound. Length of arc should be from ⅛ to ⅜ inch, depending on type and location of joint.

In the flat position the torch is usually held at right angles to the line of the joint and bisects the angle between the members (see Fig. 6). Occasionally, a forehand angle of 3° to 5° is used to allow better visibility and cleaning. When joining unequal thicknesses, the arc may have to be directed on the thicker member to obtain equal melting.

Major Suppliers of TIG and MIG Welding Equipment and Supplies

Air Reduction Sales Co., New York
Alpha Metals Inc., Jersey City, N. J.
Argopen Co., Syracuse, N. Y.
Automation Machines & Equipment Co., Milwaukee
Bernard Welding Equipment Co., Chicago
British Oxygen Co., England
Canadian Liquid Air Co., Ltd., Canada
Hammon Precision Equipment Co., Oakland, Calif.
Hobart Bros. Co., Troy, Ohio
L'Air Liquide, France
Lincoln Electric Co., Cleveland
Linde Co., New York
Liquid Carbonic Div'n, General Dynamics, Chicago
Metal & Thermit Corp., Rahway, N. J.
Mid-States Welder Mfg. Co., Chicago
Miller Electric Corp., Appleton, Wis.
National Cylinder Gas Div'n, Chicago
Reid-Avery Co., Baltimore, Md.
A. O. Smith Corp., Milwaukee
Taylor-Winfield Corp., Warren, Ohio
Vickers Electric Div'n, St. Louis
Tec Torch Co., Inc., Carlstadt, N. J.
Westinghouse Electric Corp, Buffalo, N. Y.
Wilson Equipment Corp., Paterson, N. J.

The torch should be held at the starting point until the arc has melted a bright clean puddle of required size (this takes 3 to 5 seconds). Once the required puddle is established, filler can be added.

The torch is then moved forward at a uniform rate while feeding the filler rod to the front edge or side of the puddle. The welding rod is held at an angle of 20° to 30° to the work, slightly off center to the line of the joint, and fed into and withdrawn from the molten puddle at frequent, regular, short intervals. The torch is moved back slightly to allow the filler rod to be introduced into the puddle.

When the required bead size is obtained the torch is moved forward to advance the puddle. This backward and forward motion of the torch and filler rod is repeated smoothly and uniformly in steps of 1/16 to 3/16 inch. This motion is not necessary when making a joint without filler.

Speed of welding and frequency of adding filler wire are governed largely by the skill of the operator and the nature of the work. They should be coordinated to obtain adequate penetration and a weld bead of the right contour with evenly spaced ripples.

Breaking the Arc

In breaking the arc the torch is withdrawn from the work while filler rod is still being added to feed the crater as it solidifies. As the torch is withdrawn the arc is run on to the cold filler rod and then is broken quickly. If this does not fill the crater completely the arc should be restruck quickly several times while adding additional filler.

Crater-free stops can be made on thin gauge material and on shallow weld beads by increasing the rate of arc travel. The increase in speed should be sufficient to eliminate melting of the parent metal. Run-on and run-off tabs are recommended whenever possible to ensure crack-free welds over the full length of the joint.

Horizontal, vertical and overhead welding is practical with the TIG process. Techniques for welding in these positions are generally the same as those used for flat position welding except that slightly lower currents are employed to keep the weld puddle small enough to prevent it from sagging before solidifying. In position welding, particularly vertical, it is not normal practice to use a forehand or backhand torch angle. In the vertical welding of butt, lap or fillet joints the direction of welding should be upwards.

Machine welding by the TIG process produces high quality welds quickly and at a relatively low cost. Welding speeds of up to 30 fpm are practical. Certain joints which may require close

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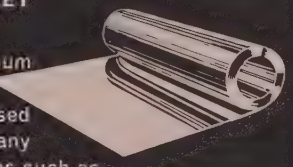

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ALUMINUM FOILS, INC.

JACKSON, TENN.

control of penetration and weld reinforcement are not practical for manual welding, but can be made easily by machine welding.

Machine welding is limited to flat position joints such as butt, edge and corner which need no filler. All the fusion weldable alloys, from 0.030 to 0.125 inch thick, can be machine welded, but 6061 and 6063 must be in compression during welding to prevent hot-short cracking. Thinner material can be joined, but jigging becomes the main problem. Thicker material usually requires filler and thus is not suitable for machine welding.

Standard TIG power sources can be used for machine welding provided they can handle the required current at a high duty cycle. The high frequency unit must have sufficient capacity for positive arc starting.

Torches should be sturdy, and equipped with water-cooled metal cups. Ample size current leads should be as short as possible. Zirconium-tungsten electrodes are recommended because of their higher current capacity. Fully automatic controls for current, argon, coolant and arc travel are necessary.

Carriage Mounted Torch

It is common practice to mount standard TIG torches on the carriages of the welding machine. The mounting must permit fine and accurate adjustment of the torch to any horizontal and vertical position, preferably by spring loaded controls which prevent slackness or backlash.

The adjusting mechanism should have fast action and not cause arc interference by introducing vibration during adjustment. The carriage itself should move steadily and without vibration. If the work is moved it, too, should move at a steady rate and be vibration free.

Machine welding technique varies with each application. Adequate jigging is essential. Much higher welding currents and speeds can be used than in manual welding and every advantage should be taken of this. Distortion is usually much less than with manual welding owing to high welding speeds.

Trouble-Shooting Tips

During TIG welding many operating difficulties may arise. Here are some of the most common ones, and suggestions on where to look for the difficulties.

When working in a confined area it is sometimes difficult to get the electrode close enough to the joint. For accessibility use the smallest possible torch and gas cup, be sure the electrode protrudes far enough, and use as short an electrode and torch cap as possible.

Visibility of the weld puddle is important. If the weldor cannot see the puddle at all times he should change his position and that of his torch; use a smaller gas cup, if possible, and a larger welding lens.

Poor cleaning action by the arc can be recognized by the absence of a bright, silvery line along each side of the weld bead and puddle and by poor wetting of the parent metal by the filler. It is usually caused by an unstable arc or insufficiently cleaned work. Trouble spots could be the high frequency unit, battery bias, open circuit voltage of welder, or low voltage power supply input. Be sure the parent metal is clean and does not have a thick oxide film.

An excessively wide bead may be caused by too long an arc or too low a welding speed for the current used. For a proper bead, check welding currents and speeds, extend the electrode, and manipulate torch for short arc.

Incomplete penetration may result from low welding currents, high arc travel speed, or insufficient edge preparation. To stop this be sure that proper welding current and arc travel speed are being used, reduce arc length, and cut down the amount of filler added to the puddle. If welding heavy gauge metal, preheating and special edge preparation and joint spacing may be needed. Before adding filler, be sure a proper puddle has been formed.

Filler feeding is sometimes difficult. When this happens the arc is not stable and repels the filler before it can be drawn into the puddle, or the technique used does not permit proper entry of the filler into the puddle. To overcome this, check feeding techniques, and be sure that proper filler wire size, welding current and arc travel speeds are used. Operation and insulation of welder and high-frequency equipment should be inspected.

Inability to direct the arc results when it lacks stiffness. Poor operating characteristics of equipment are the usual causes. To solve this problem, first remove any magnetic material near the arc then inspect the open circuit voltage, high frequency unit, battery bias and voltage on the power frequency unit. Be sure a proper size electrode is used for current.

The arc should start quickly when the cold electrode is brought within 1/16 inch of work, but should not jump more than 3/16 inch. If the arc does not start promptly, alter the high frequency spark gap, see that work is properly grounded and that electrical connections are good. Finally, be sure torch is being manipulated properly for arc starting.

Overheating may occur, permanently damaging the transformer, if the demand on the power source is too high. If required current is beyond the range of the transformer, connect two units in parallel to divide the load. If requirements are within the range of the transformer check the following: Operation of transformer cooling fan; grounding of high frequency unit to prevent stray current from damaging transformer; electrical connections in welding machine; by-pass capacitor; battery bias.

When overheating of the torch, torch leads or power cables is noticed, compare the capacity of the power cables to demand, and welding current to torch rating. Be sure coolant is flowing in torch and leads and that power cables are properly connected.

A rough weld bead surface may be caused by poor technique, insufficient current, or an unstable arc. To get a smooth bead first get a stable arc and then be sure the torch is being maneuvered correctly.

Hot shortness can be eliminated by:

1. Controlling composition of the weld pool with filler metal to produce alloy in the weld puddle which is not hot-short. Proper edge preparation and joint spacing permits addition of sufficient filler metal.

2. Using the highest welding speeds possible reduces the time at which the weld remains in the hot-short range.

3. Applying external force to maintain the weld in compression while it is in the hot-short temperature range.

■ ***Weldor makes butt weld to join two sections of aluminum pipe. Manual TIG torch is being used while aluminum filler wire is added.***

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Cast Aluminum Solar Screen

Thin aluminum castings won out over plastics, wood, masonry, steel in decorative screen for new church building in Tulsa, Okla. Quarter-inch thick panels measure 18 by 24 inches.

A UNIQUE "screen" made up of 480 cast aluminum panels proved to be the esthetic and economic answer to an architectural problem encountered in the construction of a new church building in Tulsa, Okla.

Since it by-passes the cost of dies associated with sheet metal work, it may also point the way to more widespread use of aluminum in relatively small architectural projects requiring custom designed functional or decorative details.

Architectural plans for an extension to house the large-scale educational activities of the Immanuel Baptist Church of Tulsa included a screen on the front of the building but did not bind specifications to any one material. The choice of material was left to the church Building Committee and the architect, Joseph Koberling, of Koberling, Slattery and Slattery.

Several materials were considered, including fiberglas-coated ¾-inch plywood, masonry, steel, and aluminum. Dan Mitchell, vice president of the Progressive Brass Manufacturing Co., Tulsa, suggested Tenzaloy, a special aluminum casting alloy produced by American Smelting and Refining Co. (Asarco), New York.

He cast a sample panel to demonstrate the lightness, texture and strength of the material. He also cited the low cost of maintenance resulting from the alloy's high resistance to corrosion. Despite these advantages, Tenzaloy's cost was estimated to be virtually the same as that of other materials under consideration.

After comparing these attributes, the Building Committee unanimously decided in favor of Tenzaloy. The panels were cast by Progressive Brass. Each is ¼-inch thick, measures 18 x 24 inches, and has three diamond shaped holes. One surface of the pattern was covered with rough grain plastic in order to give the exterior surface a decorative pebble texture.

The 480 cast panels were assembled with aluminum T's and angles into larger sections, 4 feet wide and nearly 12 feet high. Before assembly, they were Alodized and coated with baked-on Epo-Lux Aqua Marine epoxy base paint.

The assembled sections were hauled by truck to the site, where they were erected on stand-off mounting brackets bolted to the building wall. To prevent electrolytic corrosion, the brackets were made of ¼-inch aluminum.

As finished, the screen stands 11-⅝ inches away from the wall of the building and effectively filters the bright sunlight while forming an integral part of the exterior design. Both architecturally and metallurgically, this use of cast aluminum is reported to be proving highly successful. Asarco officials believe it shows architects how to apply unique sculptured designs to metal screens without incurring excessive costs.

The Immanuel Baptist Church was founded in 1915 and has occupied its present site for the past 35 years. The new building, which was recently dedicated, is of modern design. Located in an area that is gradually undergoing transition from residential to business uses and where several modern new stores have recently opened, the structure blends into its surroundings.

Total cost of the screen including aluminum attachment brackets and installation was $8245.

■ *The 480 cast aluminum panels were assembled into 4x12-foot sections, hauled to site, attached to aluminum brackets (left) to form complete screen (above). Design could start trend.*

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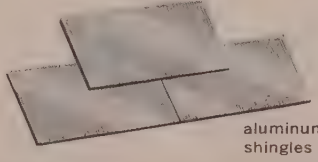
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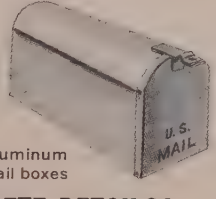

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New Refractory Resists Molten Aluminum

Furnace linings last longer and molten metal suffers less silicon contamination with Kaiser's new material.

A NEW furnace refractory that resists the attack of molten aluminum alloys has been announced by the Kaiser Refractories & Chemicals Division of Kaiser Aluminum & Chemical Corp., Oakland 12, Calif. Low in silica, and made to a special formulation, the high-alumina material is marketed in two grades — Lo-Sil and Lo-Sil Super. Lo-Sil Mortar has also been developed for use with both grades.

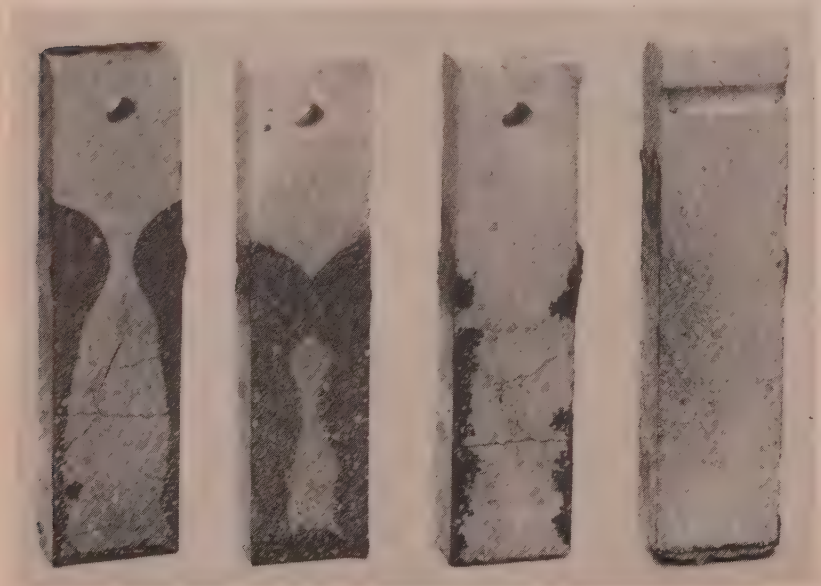
Lo-Sil Super brick is recommended for use in furnaces that must withstand the most severe service conditions or are used to produce the highest quality of metal. Lo-Sil is for use under less severe conditions.

Molten aluminum, particularly in the high performance alloys, damages the linings of reverberatory furnaces through chemical attack on the silica in the refractory. This attack causes swelling and deterioration of the refractory, and silicon contamination of the aluminum.

According to a Kaiser refractories expert, exhaustive testing showed that attack by molten aluminum on conventional 90% alumina brick is up to 500 times as severe as the attack on Lo-Sil Super brick. Lo-Sil Super is at least five times more resistant to attack by molten aluminum than the best special purpose brick available for aluminum melting furnaces, he added.

"Our special formulation plus the low silica content of Lo-Sil Super is what gives this brick such superior resistance to metal attack," explained W. Basil Leach, vice president of sales. "This has made Lo-Sil brick 1½ to 3 times better than the best aluminum melting brick now on the market."

Because of the material's high resistance to penetration, dross can be cleaned off the lining more readily, allowing the operator to minimize downtime while changing from one alloy to another. Kaiser announced Lo-Sil Super is also highly resistant to the abrasion, impact, and thermal shock resulting from a heavy charge of cold metal.



■ *After immersion in molten 7075 aluminum alloy for periods up to 30 days, the three brick samples at the left show varying amounts of metal penetration. The sample at the right, Kaiser's new aluminum resistant refractory, shows virtually no such penetration after a 30-day period in the same test.*

Impressive Test Results

A test panel of Lo-Sil Super was installed in a melting hearth at Kaiser Aluminum's Trentwood (Wash.) Works to check performance alongside standard 90% alumina brick. Core samples showed that one inch of attack occurred in the 90% alumina refractory during the processing of three million pounds of metal. Nine inches of attack occurred in 185 days during which 28 million pounds of aluminum was melted. During the same period, the Lo-Sil Super was attacked to a depth of only ⅞ inch.

Had the hearth been completely lined with Lo-Sil Super brick, silicon pickup in the metal would have been only 0.0003% or one-twentieth of that encountered with regular 90% alumina brick, the company revealed.

In an accelerated laboratory test comparative brick samples were partially immersed in molten 7075 aluminum alloy at 1400 degrees F. Standard 90% alumina brick was attacked to a depth of 1¼ inch in only six days. After 30 days of continuous immersion there was still no measurable attack on the Lo-Sil Super and only minor evidence of attack on the Lo-Sil (see photo).

In this same test Lo-Sil was compared with a recently introduced product designed especially for use in aluminum melting furnaces. After 30 days of continuous immersion, Lo-Sil brick was attacked at the metal line to a depth of only ¼ to ⅜ inch while the special aluminum melting brick was attacked an average of ½ inch on the entire sample.

Lo-Sil mortar is formulated in a similar manner to both Lo-Sil bricks and consequently possesses equivalent resistance to attack. The mortar may be used in either a dip or buttering consistency and develops good strengths at normal aluminum melting furnace temperatures.

Adaptaloy castings are easily cold formed and simplify assembly for the Sandfort Furniture Co., N. Y. Inset photo illustrates one of Sandfort's cast aluminum furniture settings—all are cast of Adaptaloy.

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Forecast impressive growth for

Aluminum in the Sixties

Despite present problems of oversupply, Alcoa's president sees promising prospects for aluminum in the decade ahead. Bullish factors include population growth, low per capita use of aluminum overseas, opening of new markets. Speech was given last month at a Nonferrous Metals Forum of the National Federation of Financial Analysts' Societies.

by F. L. Magee, President, Aluminum Company of America

FROM our vantage point at the threshold of the Sixties, we view the coming decade as one which offers both challenging problems and rewarding opportunities. The past few years have already produced some important changes in the aluminum industry, and we foresee still others as we look ahead.

In the past ten years the size of the industry and intensity of competition have increased sharply as growing markets demanded more metal. U. S. primary aluminum smelting capacity has more than tripled from approximately 743,000 tons in 1950 to about 2,420,000 tons in April, 1960. And the number of domestic primary producers has increased from three to the present six (Alcoa, Reynolds, Kaiser, Anaconda, Ormet and Harvey).

In Canada, Aluminum Co. of Canada was the sole producer in 1950, with an installed capacity of about 500,000 tons. Today, there are two Canadian primary producers—Alcan and Canadian British Aluminium Co., Ltd.—with a total capacity of about 878,000 tons. Total North American primary capacity is now about 3,300,000 short tons.

Fabricator Total Up

The number of nonintegrated fabricators of aluminum mill products in the U. S. has increased 34% from 201 in 1955 to 270 in '59, including 29 sheet fabricators and 127 extruders. This growth in nonintegrated fabricators has naturally resulted in heightened competition in the marketing of aluminum products.

The industry's expansion finally caught up with, and then outpaced, the increase in aluminum usage during the recent recession. As a result, expansion plans were deferred and a number of potlines were closed down.

Most projects have now been reactivated and many idle potlines restored to operation. But there is still idle capacity, estimated at about 465,000 tons in the U. S. and Canada combined. In the U. S. alone, idle capacity is estimated at 386,000 tons.

Complete Recovery Delayed

During 1959, complete recovery was delayed by market conditions. The first half of the year was a period of rapidly increasing sales and shipments. Much of this proved to be inventory accumulation in anticipation of a strike which did not materialize. There was also substantial buying of metal in the period prior to the price increase of December 17.

As a consequence, our industry began 1960 with unusually high inventories of aluminum in many customers' plants. These high inventories have adversely affected sales of aluminum during the first five months of 1960.

■ *F. L. Magee, president of Alcoa, recently told a nonferrous metals group that he and his firm "view the coming decade as one which offers both challenging problems and rewarding opportunities. The past few years have already produced some important changes in the aluminum industry, and we foresee still others as we look ahead."*

Another factor with which U. S. producers and fabricators have had to contend is increased imports of aluminum and aluminum products from countries where labor costs are low. The amount of imported aluminum pig used in the U. S., exclusive of scrap, has ranged from approximately 178,000 tons in 1955 to 239,500 tons in '59, an increase of about 35%. In the same period, imports of aluminum mill products have increased from 20,972 tons to 55,350 tons, or about 164%.

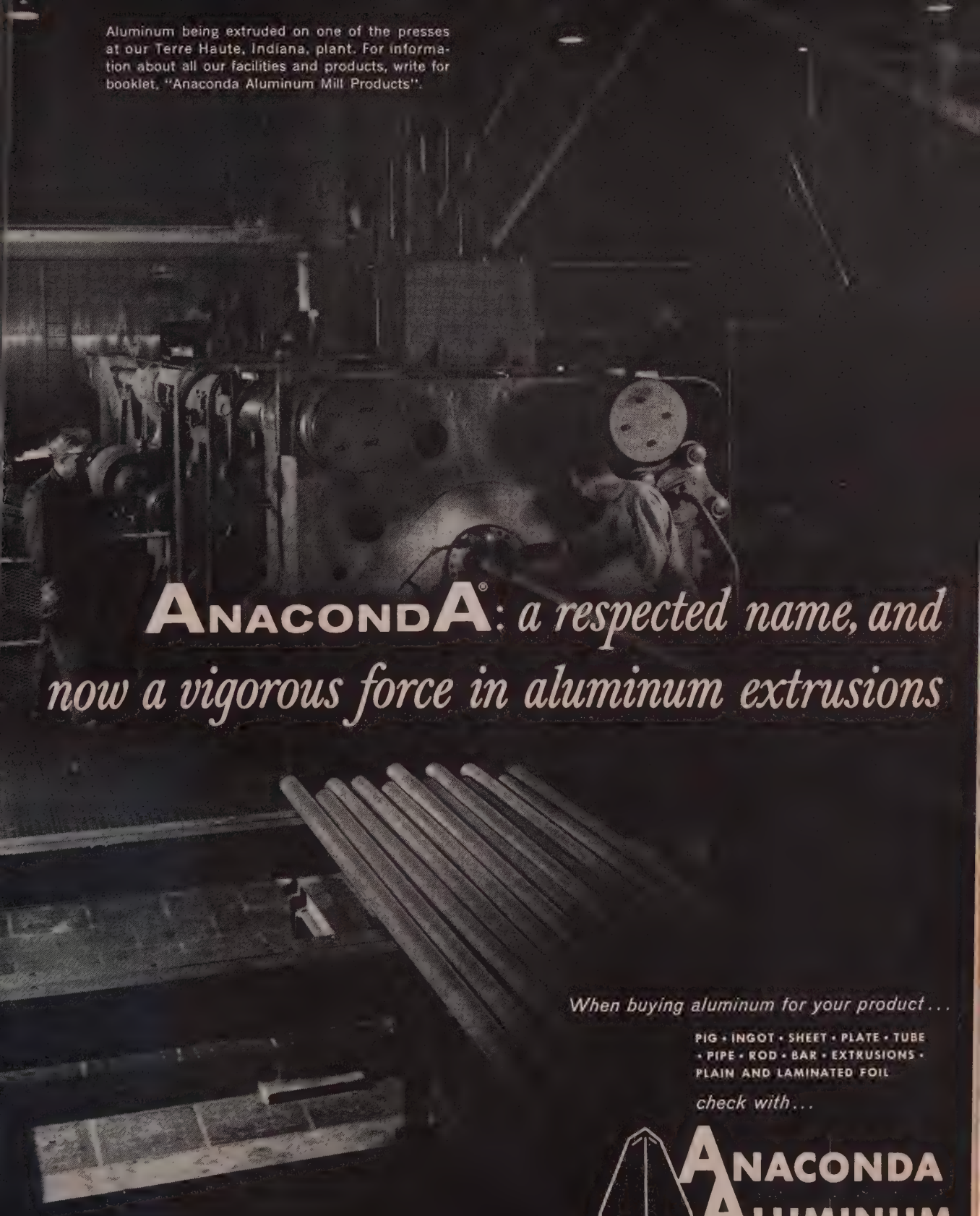
At present, business is good in Europe, and all aluminum producers except those in North America have been operating at 100% of capacity. There is no doubt that expansions undertaken by foreign producers, as well as those being programmed, are aimed largely at North American markets.

One Uncertainty Exists

One uncertain aspect of the domestic supply picture is the possible disposition of excess aluminum in the government stockpile. During the Korean emergency, the primary producers were asked by the government to expand their capacity with their own money to a greater extent than peacetime markets could have justified. In return, they were given the right to sell to the government stockpile any surplus aluminum from these facilities for a five-year period.

Contracts negotiated by Alcoa and Kaiser expired in 1958, and all shipments by them were completed that year. Reynolds completed all shipments under its contract in 1959. There remains one contract with Harvey which extends until 1963, and involves a potential unshipped balance of 270,000 tons.

The General Services Administration



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recently pointed out that there was an excess of various materials in the government stockpile and suggested that Congress consider granting authority to GSA to dispose of part of it. This excess, which includes aluminum and other materials, is valued at $4.1 billion and amounts to nearly half of the total stockpile.

Stockpile a Problem

Our industry is naturally concerned that the disposition of surplus stockpile aluminum be accomplished on an orderly basis and in such a manner as to minimize adverse effects on the market.

The current excess capacity and oversupply have resulted in unusually intense competition in the U. S. aluminum industry and a generally unfavorable price structure from the standpoint of profits, particularly for semi-fabricated and mill products. But it has opened the door to new applications where an inadequate supply would have been a decided handicap.

From a long term standpoint, none of the basic aluminum producers has any great concern about over-supply. There are substantial untapped markets both here and abroad.

One important prospect for a growth industry in the Sixties is the population increase. According to current estimates, world population is growing at a present rate of about 4000 per hour and will increase by more than 350 million in the next ten years. As world population grows, it is likely that the use of many products made with aluminum will also increase.

Aluminum Markets Grow

But even at the present population level, there are many opportunities for greater use of aluminum. New markets have been developed and established markets are using more metal — for commercial and residential building, automotive applications, rockets and missiles, in the electrical industry, and in packaging and containers, among others.

A comparison of the U. S. and world per capita consumption emphasizes the opportunities for the light metal. In the U. S., where there has been greater market development than in any other country, per capita consumption in 1960 will be about 27 pounds. For the entire world, the figure is only a little more than 3 pounds, according to the best estimates.

It is apparent that there is much room for increased use of aluminum both at home and abroad. Two of the best examples of high population and low per capita consumption of aluminum are, unfortunately, behind the Iron Curtain and not available for development.

Red China, with a population of 650 million in 1959, had an average per capita consumption of approximately .15 of a pound of aluminum. The Soviet Union, whose population totalled 210 million in '59, used about 5.4 pounds of aluminum per capita. With such tremendous market possibilities, we hope that it may some day be possible to reach a satisfactory conclusion to the tensions which divide the world.

In the meantime, many opportunities exist in the Free World. India, for example, had a population of approximately 410 million in 1959, and a per capita consumption of only two-tenths of a pound of aluminum. By 1970, its population is expected to increase to 504 million. Only a small increase in per capita use of aluminum would mean a substantial volume of aluminum products.

Western Europe and the United Kingdom together had a population of about 337 million in 1959, and per capita consumption of approximately 8 pounds. Although its population is expected to reach only about 360 million by 1970, its use of aluminum is expected to increase about 75%. Comparable opportunities seem to exist everywhere.

Expansion Abroad

These expanding market possibilities explain why U. S. aluminum producers are turning their attention abroad. In some cases, it is possible to increase exports of aluminum products made in U. S. plants. In others, arrangements have been made to join with local interests in establishing operations which can compete more successfully in foreign markets.

Some countries are examining this latent demand for aluminum in the light of their own undeveloped resources, and are actively considering bauxite and aluminum production.

Several North American producers have been linked with discussions concerning African projects, for example It is important to note, however, that successful development of an aluminum industry does not depend on bauxite and low cost electrical energy alone. Skilled manpower, adequate capital, and convenient markets must also be considered.

Investment in bauxite and aluminum-producing facilities overseas frequently poses difficult questions. While bauxite and electrical energy can frequently be found in convenient relationship, they may not be well situated with respect to markets or skilled labor. Adequate capital for local participation is often lacking, and the political situation may be less than reassuring.

Nevertheless, North American producers are looking into these various opportunities. Indications are that in some cases the time may not yet be ripe for such ambitious undertakings.

We have been fortunate in the development of our aluminum industry. There have been vast reserves of bauxite on which we have drawn heavily. Although the domestic supply of high grade ore is practically depleted, extensive reserves in the Caribbean and South America have traditionally been available to the U. S. Furthermore, there are low-grade aluminous materials within our borders which, though not economical to refine for commercial purposes, could be utilized in the event of a national emergency.

Ample Electrical Energy

Ample sources of electrical energy have also been readily available for the production of aluminum in the U. S. While desirable new hydroelectric sources are no longer easy to find here, the possibilities for smelters based on solid fuel are bright, even in the light of attractive large hydroelectric developments overseas.

Other factors which have made the U. S. a favorable climate for the growth of a strong aluminum industry are the availability of capital, proximity of markets, high level of technological development, and political stability.

Eventually, many of the less developed areas of the world are likely to receive a strong economic stimulus from the expanding use of aluminum. There is ample evidence that the use of aluminum will increase greatly throughout the world. U. S. producers intend to promote this increased use, both in the U. S. and in foreign markets. As the momentum of this growing demand increases, new smelting facilities are certain to be required.

The history of the aluminum industry has been one of continual search for new markets. Large sums have been spent for research and development. Every effort has been made to gain acceptance in applications for which aluminum's many natural advantages made it best suited. The resulting growth has been almost legendary.

Hope-Filled Future

As we enter a new decade, there is no reason for believing that this pattern will change. The markets which lie ahead are even greater than those already gained, and the industry's ability to supply them is at an unprecedented level. Throughout the industry, there is a pioneering spirit that breeds progress.

I feel confident that we can look for a great increase in the use of aluminum both at home and abroad, and that the Sixties will be a period of impressive growth for the aluminum industry.

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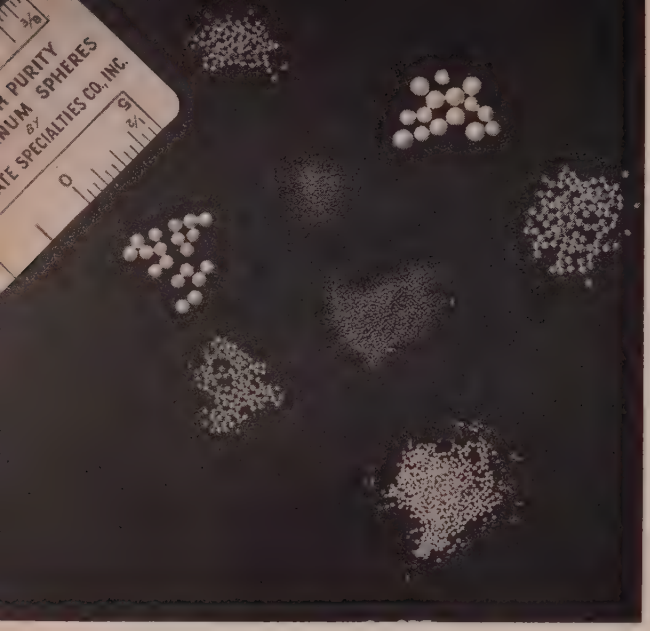

ULTRA-PURE ALUMINUM

for ultra-miniature transistors diodes rectifiers

IMPURITIES in metals can have an adverse effect on electronic components such as transistors, diodes and rectifiers. Further complicating the problem for manufacturers of electronic components is the fact that knowledge of only the percentage of purity is inadequate. It is just as important to know the type and extent of impurities present in the alloy.

Thus, Accurate Specialties Co., Inc., Woodside, N. Y., a leading producer of semiconductor preforms and components, found it necessary to establish a source of basic pure metals such as aluminum, indium, lead, tin, gallium, etc. Last year they formed a subsidiary company called High Purity Metals, Inc. located in Hackensack, N. J.

High Purity Metals' production of ultra-pure electronic metals has been so successful, that, in addition to supplying the parent company's requirements, it has become a new and unique source for ultra-pure metals.

Ultra-pure aluminum and indium are now in great demand by the semiconductor industry. Since its birth in mid-1948, this industry has encountered unique metallurgical problems in the manufacture of remarkable pill-sized transistors, diodes and rectifiers.

Precision Preforms Used

At the heart of these devices is an "alloy junction" between indium and germanium or aluminum and silicon which creates the "semiconductor" effect. This junction is accomplished by melting a precise preform of indium or aluminum against a chip of germanium or silicon at temperatures in the range of 600° to 900° C. These precision metal preforms are usually in the form of washers, discs, or spheres.

Obviously, purity becomes a critical variable to the semiconductor producers, since it will affect the production "yield" (number of acceptable units compared to the gross number entered into the production process). Accurate Specialties Co. and its subsidiary, High Purity Metals, teamed up last year on one such critical problem in the manufacture of silicon transistors and diodes.

This type of semiconductor device requires ultra-pure aluminum preforms to accomplish the alloy junction. Using special refining techniques, High Purity Metals was able to produce 99.99+% aluminum for Accurate Specialties, who formed the aluminum into high purity aluminum spheres with remarkable accuracy. The aluminum spheres are now mass produced in lots of millions in a range of diameters from .004" to .125" in infinite increments, with sphericity and diameters held as close as plus or minus .0001".

Spheres Offer Advantages

Using these high purity aluminum spheres in forming alloy junctions, semiconductor manufacturers have had some interesting advantages over using conventional preformed washers or discs.

1. The aluminum sphere offers the least amount of oxide per unit volume, and therefore has the best "wetting" qualities.

2. The precision sphere will roll, and therefore lends itself to automatic loading into the alloying jigs.

3. The ultra-pure aluminum offers them the best possibilities for reproducible results in a specific silicon semiconductor device.

The aluminum program at High Purity Metals is proceeding toward an ultimate purity of 99.9999+%. Meanwhile, other metals in production and under development include:

Material	% Purity
Indium	99.9+; 99.99+; 99.999+
Lead	99.9999
Tin	99.999
Gallium	99.999
Germanium	to semiconductor quality

"Our process is analogous to wringing out a wet sponge," explains Dr. Val Kudryk, vice president and director of research, who has been responsible for this product development. "Removing impurities to arrive at the level we require requires the same persistence. You wring out the sponge until you believe it is thoroughly dry, and then wring it a bit more and discover a few more drops of moisture.

"We do the same thing in producing ultra-pure metals, using specially developed refining techniques."

In addition to its refining setup, High Purity Metals has laboratories equipped with spectographic and polarographic equipment which permits exacting control over the product. They can verify results detecting major, minor, and trace constituents to less than 1 part per million.

Although immediate applications of High Purity Metal's products cover the electronic industry's requirements, the company has its eye on other industries where ultra-pure metals such as aluminum would find use. For example, high purity indium has already found interest in the nuclear field for shielding materials.

Ultra-pure aluminum is being considered for jewelry, appliance and automotive parts. As High Purity Metals develops additional capacity, it will certainly explore these other uses.

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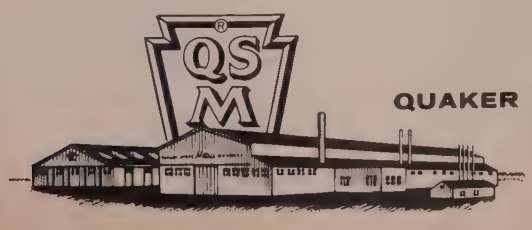
THIS new INGERSOLL scalping machine is another important step in QSM's production of quality aluminum sheet and coil. Taking the aluminum ingot directly from our cast house, it removes oxides and roughnesses which may have been built up on the surface. It assures a clean, smooth ingot ready for the rolling mill. The first horizontal scalper in the country, in embodies many new design features to aid QSM in producing aluminum sheet and coil of the finest quality.



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Division of HOWE SOUND COMPANY

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Tough Welding Problem Solved

With its lower heat input to the work, the new West-ing-arc MIG welding gun by-passed problem of joint geometry, permitted joining of large, unsupported sheet areas without fixturing.

by W. R. Jebson, Manufacturing Engineer, Electronics Division, Westinghouse Electric Corp.

ADVANCE planning, plus the use of the SA-110 West-ing-arc welding gun, resulted in an annual cost reduction of over $50,000 in the manufacture of aluminum electronic components for the U. S. Navy. The components are built by the Baltimore Electronics Division of Westinghouse Electric, and the welding gun is made by the Westinghouse Buffalo Welding Department.

The Electronics Division, which has a long history in the development and manufacture of electronic equipment for the Army, Navy, and the Air Force, started to manufacture an important radar system for the Navy. Inherent in the design of the radar's cabinets, consoles, and chassis were a number of welding problems resulting from rigid military specifications.

Construction of these units was such that tolerances had to be reduced to as little as ±.005-inch on some assemblies in order to assure proper fit and interchangeability.

The use of the tungsten-arc, inert gas shielded (TIG) process would have required expensive tooling to compensate for shrinkage. The high heat input to the work would have caused buckling and distortion, requiring extensive straightening operations.

The metal arc, inert gas (MIG) equipment available was not practical for welding internal sections because it could not be handled easily in the confined space. In addition it was not adaptable to welding aluminum sheet as thin as that involved in this apparatus.

Several attempts were made to use .048 diameter No. 4043 welding wire, but reliability of feeding was not acceptable on this small a wire.

A program was undertaken, prior to manufacture and as a part of manufacturing planning, to study and analyze anticipated welding problems with personnel from Westinghouse Headquarters Manufacturing Planning and Buffalo Welding Departments. Such a study was especially important since the fabrication and welding represent a major part in manufacture of these units.

The SA-110 West-ing-arc Gun was selected by the Electronics Division's manufacturing engineers as most feasible for these applications. This gun allows the use of reduced wire diameters (.030 to .045) and increases the portability and stability of the MIG welding process applied to thinner sections.

Little Training Required

With the SA-110, operators required little or no training before using the process in actual job applications. Welding speeds were increased up to seven times as compared to TIG welding in most cases. The reduced heat input to the welding sections kept distortion to a minimum, simplifying the tooling needed to obtain acceptable tolerances.

The assemblies were first tack welded while nested in the fixture and then removed to nearby stations for completion of the welds. This substantially reduced the time in the fixture and enabled one fixture to supply five welders.

Cabinet and console assemblies must be fabricated in such a way as to eliminate radio frequency radiation. This requires the welding of all seams. Generally, the thickness of the aluminum alloy (7250-2) ranged from .090 to .125 inches.

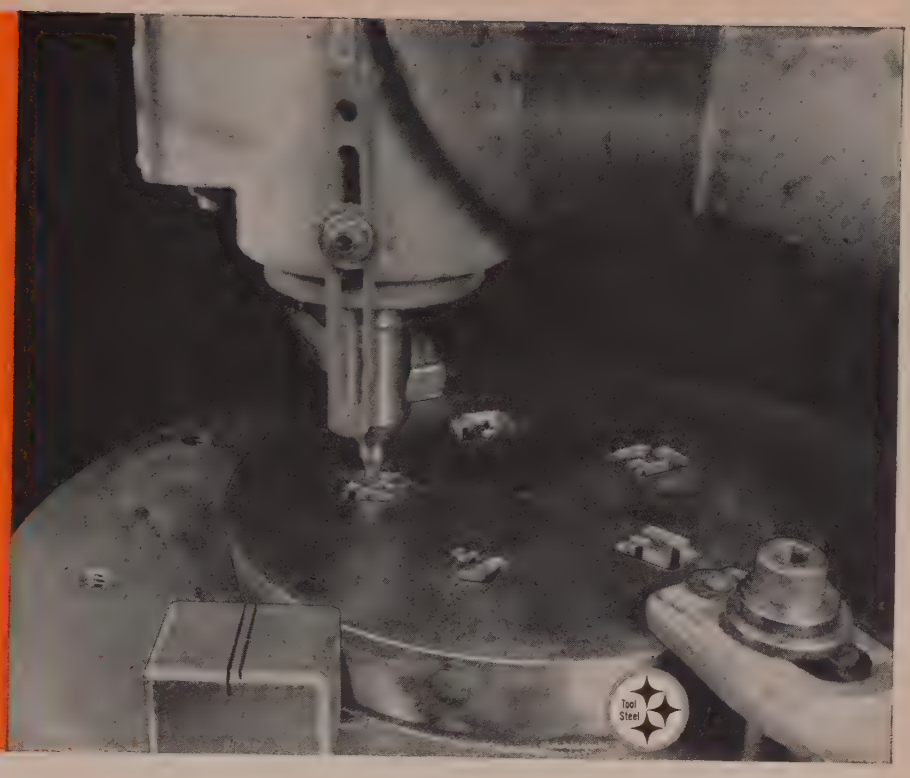
Using current settings of 110-125 amperes and 3/64-inch diameter 4043 wire, sound welds were satisfactorily made with no penetration on the inner surface. The SA-110 proved valuable in applications that had been difficult to weld with the TIG process due to joint geometry.

In applications that required welding to large unsupported areas of sheet metal, heat induced in the joint would cause the sheet to expand away from its mating part. It was found that the SA-110, with its lower heat input to the work, relieved this problem to such a degree that no fixturing is required in the welding of these joints.

The SA-110 has been the answer to successful welding on this application and through sound manufacturing planning in conjunction with engineering on new designs, further and more effective use is being made of this process throughout the produced line.

The welder is producing a seam weld on a radar equipment cabinet at Baltimore Electronic Division. Lap joint is in ⅛-inch aluminum sheet. He's using 110-125 ampere current and 3/64-in. diameter welding wire.

Latrobe's EXTRUSION TOOL STEELS



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Yoder Tube Mills speed tailpipe production at AP Parts Corporation

The AP Parts Corporation (Toledo, Ohio), world's largest producer of replacement mufflers and tailpipes, uses 2 YODER Tube Mills to produce more than *300* ft. of 1¾", 1⅞" and 2" tubing per minute.

According to Mr. John Grindle, Plant Engineer, the two-man operated YODER Mills are vital to the production of the entire plant. "YODER Tube Mills earn their keep daily. They are easy to set up, maintain and operate ... the welds are clean and uniform. We depend on them for constant quality, high production and minimum downtime".

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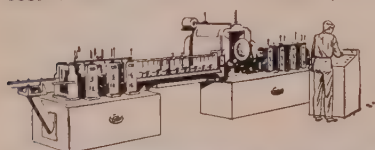

ENGINEERING YODER MANUFACTURING
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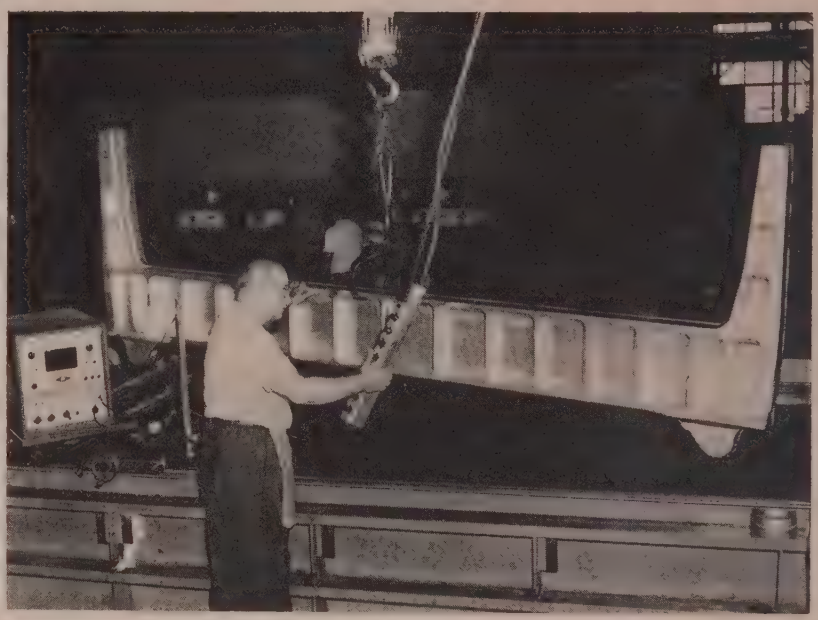


Closed-Die Forgings Form Main Jet Bulkhead

Twenty-five pairs of closed-die aluminum forgings, the largest of their type ever made for a commercial plane, are being made at the USAF plant of Wyman-Gordon Co., North Grafton, Mass. Each pair of forgings will be used to form the main bulkhead of the jet Convair 600s now being built by Convair Division, General Dynamics Corp. for American Airlines.

Each bulkhead was formed from a single aluminum billet with resultant greater strength and material economy than was otherwise possible.

Forging the 12-foot-long, 800-pound bulkheads presented an unusual problem in that the ends had to be turned in such a manner as to preserve grain flow and prevent material waste inherent in other forming methods.

The 19-inch diameter 70-79S aluminum billets were subjected to a wide range of Wyman-Gordon equipment, including 1500-ton and 7700-ton side cylinder presses and a 50,000-ton closed die press. Proper die design coupled with close temperature control during forging and heat-treating operations assured internal soundness and fine grain size requirements.

Photo shows immersion ultrasonic inspection test of one of the forgings. Finished weight of two of these pieces totals 1200 pounds.

Convair officials are reported to be highly pleased at the successful forging of the bulkheads.

Harvey Sells Stock for $85 Million Integration Move

Harvey Aluminum proposes to become a fully integrated producer of primary aluminum and produce a complete range of fabricated aluminum products. To do this, a large expansion program including primary production facilities as well as aluminum fabrication equipment has been announced.

At the same time, the company revealed that it had filed a statement with the Securities and Exchange Commission to permit the public sale of 750,000 shares of A common stock in the company.

Proceeds from the stock sale will be used to finance the expansion and provide additional working capital. The expansion program will reportedly cost over $85 million; could run as high as $100 million.

Rated annual capacity of Harvey's primary aluminum plant at The Dalles, Ore. will be raised from the present 54,000 tons to 67,000 tons. Last year, according to a company statement, the plant produced 58,000 tons of aluminum. It has also been reported that Harvey will spend $30 million for an alumina plant (the company presently buys alumina from Japan) and some $40 million for a 60,000-ton capacity aluminum rolling mill. The company will also con-

struct or equip warehouses at Torrance and elsewhere.

Fabricating facilities to be installed at the reduction plant will include billet casting, wire, rod, and related equipment. The Torrance plant, which is primarily an extrusion and forging mill, will get a merchant bar mill and conduit producing facilities.

In the company's registration statement with the SEC, it was stated that the Harvey family owned all of the outstanding four million shares of B common stock. Upon the sale to the underwriters of the 750,000 shares of A common stock, the Harvey family will maintain about 84% of the outstanding voting stock.

The new stock offering is the first public distribution of shares of the company, which has been wholly owned by the Harvey family since the company was founded in 1914 by Leo M. Harvey. Proceeds from the offering will be retained by the company. None of the Harvey family stock will be offered.

The company, which was incorporated 18 years ago, now employs 2900 people, and processes about 30,000 tons of fabricated aluminum products per year. Its sales have increased from $33,715,000 in 1955 to $60,886,000 in 1959. Its net income has grown from $2,127,000 in 1955 to $4,481,000 last year.

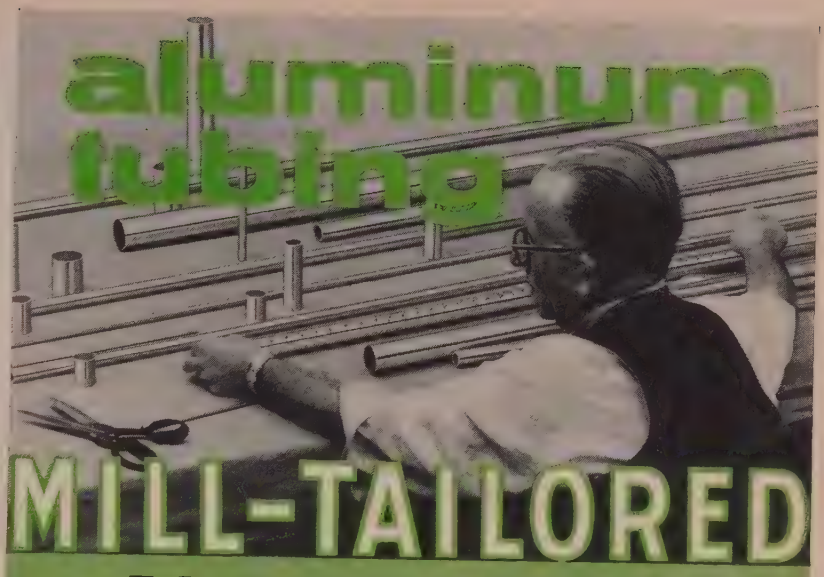
Officers are Leo M. Harvey, president; Lawrence A. Harvey, chairman of the board and executive vice president; Homer M. Harvey, vice president; Herbert Harvey, vice president, manufacturing.

New Trailer Line Meets Higher Cube Requirements

Brown Trailer Division, Clark Equipment Co., has introduced a new exterior post aluminum trailer designed to give operators more room for cargo per pound of trailer weight. It is being offered in two basic models and in two standard model variations for western service.

The biggest model has 2600 cubic foot capacity, 94-inch load-width plus a 114-inch rear inside loading height, which makes it the largest in Brown's present line.

Developed after several years of research and engineering, the trailer in-



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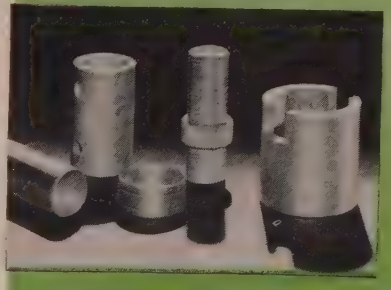

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5 GOOD QUESTIONS ABOUT ALUMINUM FORMING...

Here are answers Kaiser Aluminum Distributors have given to specific questions about forming aluminum. If you don't see the answer to your question here, ask your Kaiser Aluminum Distributor.

Q. What press capacity is needed to bend ⅛ 3003-H14 to a right angle in an "air bend" press brake operation?

A. See chart below.

APPROX. PRESSURE IN TONS PER FOOT OF LENGTH FOR BENDING 3003-H14

Metal Thickness	Width of Die								
Inches	⅜	½	⅝	¾	⅞	1	1¼	1½	2
.032	0.50	0.37	0.30						
.048	1.08	0.91	0.65	0.54	0.462				
.063	1.83	1.38	1.10	0.92	0.80	0.69	0.55		
.080	1.00	2.25	1.80	1.50	1.30	1.13	0.90	0.75	
.094	4.15	3.11	2.49	2.07	1.78	1.56	1.24	1.04	0.78
.125		5.25	4.40	3.67	3.15	2.75	2.20	1.94	1.38
.188		11.10	8.80	7.34	6.29	5.50	4.40	3.67	2.75
.250		22.0	17.7	14.7	12.7	11.0	8.80	7.40	5.50

Derived by: Tonnage = (1.33) $\frac{\text{tensile} \times 12'' \times t^2}{\text{width of Die} \times 2000}$

Pressures shown are for 3003-H14, for 1100-H14 multiply by .82, for 5052-H34 multiply by 1.73 and for 2024-T3 multiply by 3.18. For any other alloy or temper: $\frac{\text{typical tensile}}{22{,}000}$ times the figure shown in the table.

The tonnage shown is for an angle bend of one foot in length. For any other length, multiply pressures shown by length of stock in feet. Bend radii should be used as recommended by your Kaiser Aluminum Distributor and width of die required to produce such a radius may be found by the formula Wd = R/.156 where Wd = width of die, R = radius desired and .156 is a constant when the punch, or knife, radius is equal to or greater than the metal thickness.

Best control of aluminum alloys is obtained when the punch radius is equal to or only slightly less than the finished inside radius desired.

Q. What preparatory steps should I take before forming aluminum?

A. It is essential that all scale from previous steel forming operations be removed from the die members before processing aluminum. It is also good practice to be sure the die is free from tool marks, nicks and gouges. A little lubricant applied to the die every second or third hit is good insurance for proper forming of aluminum in press brake operations.

Q. How can I eliminate flat spots on 2024-T4 bar stock which I put through a centerless through-feed grinding operation?

A. The cause is undoubtedly the result of having insufficient driving power between the feed wheel and the work, allowing the work to stop rotating at in-

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HIALEAH, FLORIDA Fullerton Metals Co.

HONOLULU, HAWAII
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Earle M. Jorgensen Co.
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Chase Brass & Copper Co. Hubbell Metals Inc.

LITTLE ROCK, ARKANSAS Delta Metals, Inc.

LOS ANGELES, CALIFORNIA
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Eureka Metals Supply Co.
Earle M. Jorgensen Co.
Reliance Steel & Aluminum Co.
U. S. Steel Supply Div.—United States Steel Corp.

LOUISVILLE, KENTUCKY Hubbell Metals Inc.

MEMPHIS, TENNESSEE Hubbell Metals Inc.

MILWAUKEE, WISCONSIN
Chase Brass & Copper Co.
Fullerton Metals of Wis., Inc.
Lewis Steel & Aluminum Co., Inc.

MINNEAPOLIS-ST. PAUL METROPOLITAN AREA
Chase Brass & Copper Co.
Fullerton Metals Co.
Korhumel Steel & Aluminum Co.
U. S. Steel Supply Div.—United States Steel Corp.

AND 5 GOOD ANSWERS BY KAISER ALUMINUM DISTRIBUTORS

tervals during the grinding cycle. The remedy is to apply a pressure roller to the top of the work-piece or leave more stock for the grinding operation to remove.

Q. **How can I prevent slug pick-up when punching .125 diameter holes in .020 aluminum sheets?**

A. Reducing the die clearance to 5% or .001; for example, the use of a .125 diameter punch and a .126 diameter die opening usually remedies slug pick-up on light gauge aluminum sheet. It might also be well to check the viscosity or tackiness of the lubricant. Piercing generally requires only a thin film of a light bodied lube.

Q. **I have heard that elongation determines formability; that is, the greater the elongation the better the formability. How then can I judge 1100-H14 against 5052-H34 since their typical elongations are both rated at 9%?**

A. Formability is a simple name for a complex property effected by many characteristics of the alloy and forming conditions. Elongation is only one of many indicators of formability. One other gauge is the bend radii.

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corporates features to meet operator requirements for higher cube and lowest maintenance, including a special design one-piece leak-proof roof, new rugged rear frame and rear doors, new 25-inch wide .063 skin sheets, and special-design extruded post construction.

According to Brown's general manager John R. Wood, Jr., the four-model series of 94-inch wide trailers was developed to fit operators' demands for higher cube without an undue weight penalty, and at reasonable cost.

Extra-wide trailers are available in 35, 38, 39, and 40-foot lengths in Eastern and Western straight-floor models and Eastern and Western step-floor models. The difference between Eastern and Western versions of the two different models is a side door provided as standard on all Western models, and higher standard over-all height.

Straight-floor models are designated AXW and AXW-W (Western), and the step-floor models are designated AMXW and AMXW-W (Western). The step-floor models have a five-inch step 95½ inches from the front wall and a rear inside loading height of 102 or 114 inches. The straight-floor models have a rear inside loading height of 98 or 110 inches. Rear door opening width is 93 inches and inside rear load-width is 94 inches on all models.

The trailer is built using Brown's standard stressed skin or monocoque design so the floor sills, side and roof stiffeners form a continuous circle around trailer. Brown says this provides operators with a strong, light body capable of withstanding severe bumps, wracks, sway and load shifts.

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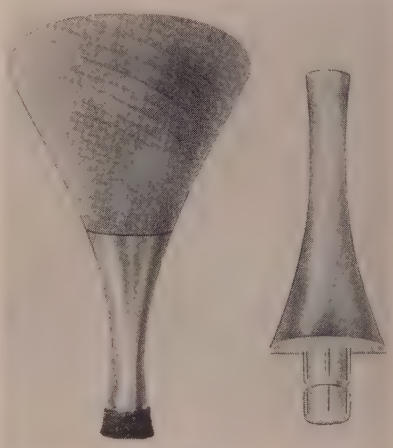

Heels for Women's Shoes Die Cast in Aluminum

Aluminum spike heels for women's shoes are being cast by the Newton-New Haven Co., West Haven, Conn. Wood was formerly used, but as heel designs became higher and slimmer the material proved to be too weak.

Rather than redesign its products an Eastern heel manufacturer contacted Newton-New Haven who came up with the die-cast aluminum heel. It possesses all the needed strength, says the firm, without sacrificing design or style.

A hole cast in the heel shaft allows a wooden plug to be inserted to which a leather lift is fastened.

Improved 2011-T3 Screw Stock Eases Machining

Kaiser Aluminum says it has improved alloy 2011-T3 screw machine stock so it now affords more consistent and easier machining.

The new alloy, called Micro-Chip, was extensively field tested in many screw machines being used on a variety of products. Kaiser says improved machining characteristics were evident in 90% of the operations.

"The comprehensive national test program also demonstrated that use of the stock makes possible smaller and finer chips, and can materially extend cutting tool life," says W. J. Lawler, Kaiser sales manager of rod, bar and wire.

The stock is color coded and chamfered at both ends.

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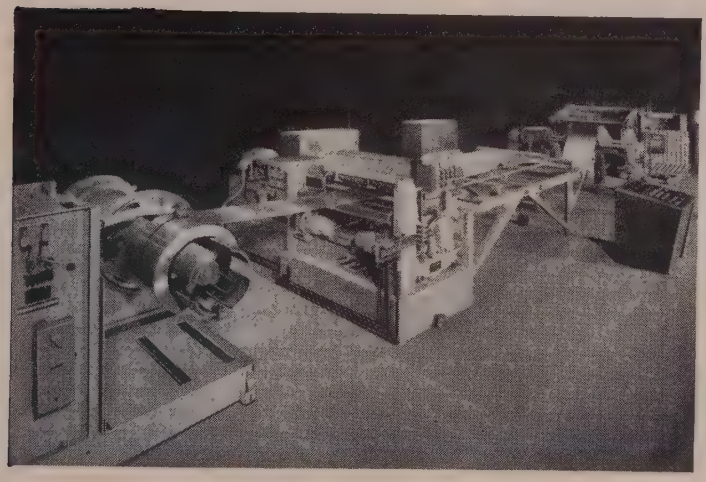

Overall view of new Voss "coil leveling line" for production of siding quality aluminum up to 48" wide. Modern equipment such as this means better quality aluminum from Sheet Aluminum Corporation.

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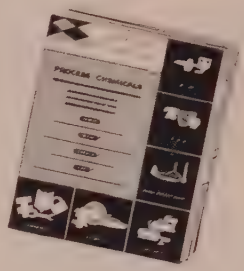

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New Bi-Alloy Roll-Bond Is More Puncture Resistant

Many people have punctured freezer compartments of refrigerators by using sharp-pointed instruments to speed defrosting, or in the removal of ice-cube trays and tight-frozen food containers. A new Olin-Mathieson product should minimize the chances of such damage. It is an improved form of Roll-Bond that has been adopted by Westinghouse.

In conventional Roll-Bond material, any desired tubular pattern is formed between two sheets of aluminum alloy that are metallurgically bonded together by heat and pressure. Almost all major appliance manufacturers use Roll-Bond evaporators, developed in 1954, to make refrigerator evaporator plates.

The improved form is a bi-alloy Roll-Bond sheet—that is, it is made of two different aluminum alloys. One side of the sheet is made of a hard, tough aluminum alloy that has roughly twice the tensile strength of the alloy now used for both sides of the conventional Roll-Bond sheet. This harder alloy, top surface of upper photo, is highly resistant to damage by sharp implements—and its flatter profile is a more difficult target for the pick wielder.

Westinghouse studies indicate that more than 90% of punctures are made on the inside of the evaporator plate—where the tougher alloy of the new Roll-Bond material is now placed.

The process for making the bi-alloy Roll-Bond sheet was developed by the product engineering group at Olin Mathieson's Roll-Bond plant in East Alton, Ill. Substantially different manufacturing techniques are employed than those used in manufacturing conventional single-alloy Roll-Bond, the company reported. However, the new tube-in-sheet is rolled and formed on present equipment. And the tubular pattern inside is hydraulically inflated in the same way. The new form is handled in the same way in making evaporator plates and other heat-transfer products.

Westinghouse has re-designed its evaporator circuitry, adding about 30% more tube within the same size sheet to compensate for the smaller tube cross-section.

Special Aircraft, Missile Sheet Introduced by Dow

Magnesium sheet is now being made in special thickness tolerances for aircraft and missile use by The Dow Metal Products Company, Division of The Dow Chemical Company, Midland, Mich.

The closer tolerances are available in the standard thicknesses in AZ31B, HK31A and HM21A alloys in sheets up to 48 inches wide. They are one-half of standard tolerances for most thicknesses. In the 0.050, 0.063, 0.071, 0.080 and 0.090 inch thicknesses, for example, the close tolerance is ± 0.002 inch, compared to a standard tolerance of ± 0.004 inch.

Dow pointed out that aircraft and missile designers must design to minimum permissible thickness when computing area available for stress distribution, but to maximum permissible thickness when computing the part weight. Thus the closer tolerances will reduce the weight penalty so important in aircraft and missile design, Dow said.

Scuff Plate Gives Weather, Insect Seal

The all-aluminum scuff plate and threshold pictured is a new design concept developed by Skuff Guard, Inc., Miami 42, Fla., to provide an efficient door weatherstrip and insect seal that is easy to install and maintain.

Made of high strength aluminum extrusions, the guard is fitted with vinyl tube for a tight pressure seal along the full width of the door. The guard can be installed on either side of the door for in or out opening. Rounded surfaces of the threshold — devoid of heel or toe catching edges — are a safety advantage. In addition, there are no undercuts to collect dirt.

The product is available in mill, polished, satin or gold anodized finish to match other door hardware.

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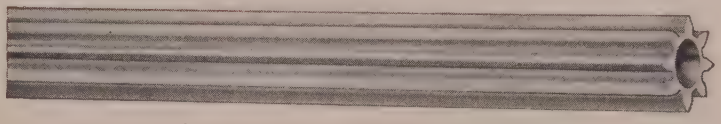

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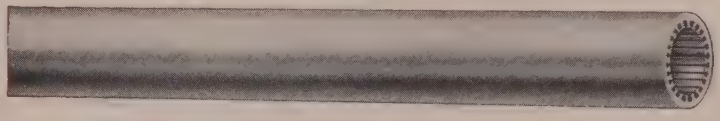

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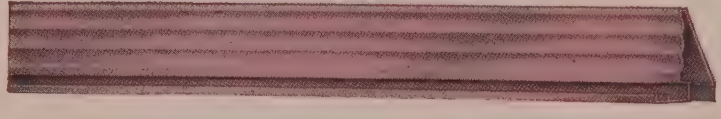

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Aluminum Increases Mobility of Aircraft Maintenance Vans

To increase mobility through weight reduction, aluminum is being used in the fabrication of 64 vans designed to serve as field repair bases for electronic equipment installed in Marine Corps aircraft. The vans are being built by Consolidated Diesel Electric Corp., Stamford, Conn., in accordance with a $500,000 contract with the U. S. Navy purchasing department.

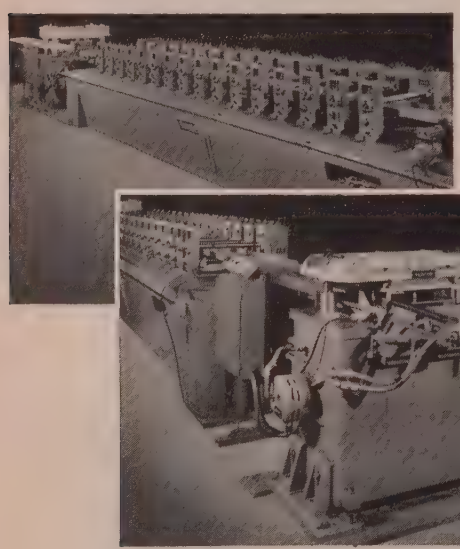
Two vehicles are combined to make one complete, air-transportable maintenance shop. They consist of aluminum framing covered with aluminum sheet. Each van is 12½ feet long, 8 feet wide and 7 feet high. Total weight of a unit is 3400 pounds. Kaiser Aluminum & Chemical Corp. provided the 6060-T6 and 5052-H32 aluminum alloys used in van construction.

Modular workbenches run the full length of both outside walls and cabinet space is provided beneath. Interior lighting is fluorescent, and an emergency battery lighting system is included.

A unique feature of the vans is the quick disconnect undercarriage. After loading, the undercarriage is removed by releasing four latches and carried as a separate unit. It is designed for 20-mile-per-hour highway travel and is steered by a conventional tow bar.

Vans are glass-fiber insulated and are designed to operate in any climate. Air conditioning equipment maintains 80°F temperature and 50% humidity in 115°F heat. Heating units will keep temperature at 67°F when it is minus 40°F outside.

Electrical power to operate vans and service aircraft is provided by an external 120/208-volt, 3 phase, 400 cycle a-c source. An entrance box provides an inlet power receptacle, lighting controls and connections for a 28-volt d-c transformer rectifier. Each two feet of bench space is equipped with power outlets.



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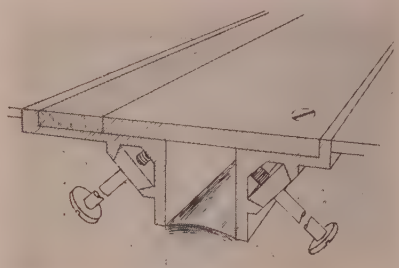


Expansion Joint Covers Fit Any Floor-Wall Junction

A complete new line of architectural aluminum expansion and seismic joint covers has been developed by Architectural Art Mfg. Inc., 3239 N. Hillside, Wichita, Kan. Covers can be used for expansion joints from 1 to 6 inches wide.

Called Wedge-tite, the assemblies can be used with any type of floor, at floor and wall junctions and at wall and ceiling junctions, says the firm. Covers come with a smooth finish for wall and ceilings, and a smooth, fluted or abrasive finish for floors. Clean line appearance is achieved by the use of a rubber-cork strip in the expansion joint (see photo).

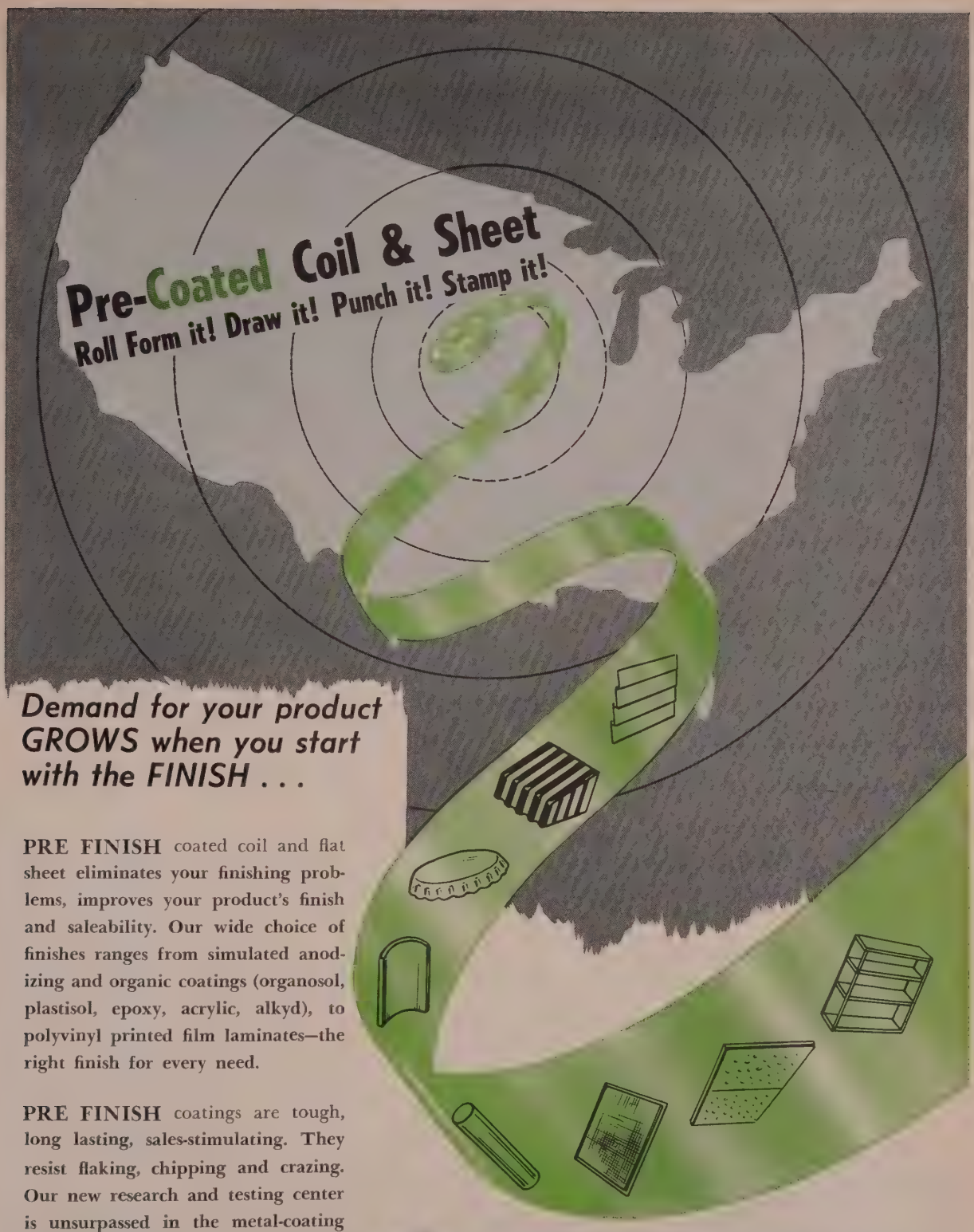
In areas where earthquake codes call for large seismic cover assemblies, units can be supplied that offer up to a full 6 inches of movement.

Covers are natural anodized, but can be colored.

Pilot Container Plant Being Built by Reynolds

A pilot plant for development of new types of aluminum containers will be built by Reynolds Metals Co. at Bellwood, Va., near Richmond. To be known as the Container Development Plant, the 20,000-square-foot building will house production tests on experimental aluminum cans and semi-rigid containers. Cost will be approximately $70,000.

The plant will be part of Reynolds new centralized Packaging Research Division which includes a foil packaging research laboratory, pilot printing plant and machinery development section, all located in Richmond.



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Straightener Handles Quarter-Inch Wire Automatically

The new Shuster IAVS variable speed automatic wire straightening and cutting machine, for wire ranging in diameter from 1/16 to ¼ inch, is being manufactured by Mettler Machine Tool Inc., New Haven 4, Conn.

Components include straightening arbor with five elongated split dies; Reeves variable speed units for feed ranges from 50 to 200 fpm; feed roll housing totally enclosed with shafts; angled electric control panel for one-position operation; Micro switch; solenoid operated roll-type clutch; drive shaft and fly wheel.

Machines are manufactured in eight different standard models including three constant speed models geared to feed up to 150 fpm and two models designed for shaped stock. They are supplied with the Shuster 12-roll central foot shaped stock straightening unit in place of a rotary arbor.

Mettler Machine also manufactures this type machine for specific applications, such as special speed and capacities for heat treating, with feeds for press operations, etc. There are 51 Shuster models of wire straightening components and straightening and cutting machines with from 0.020 to 11/16-inch capacities.

Special Roofing System Ideal for School

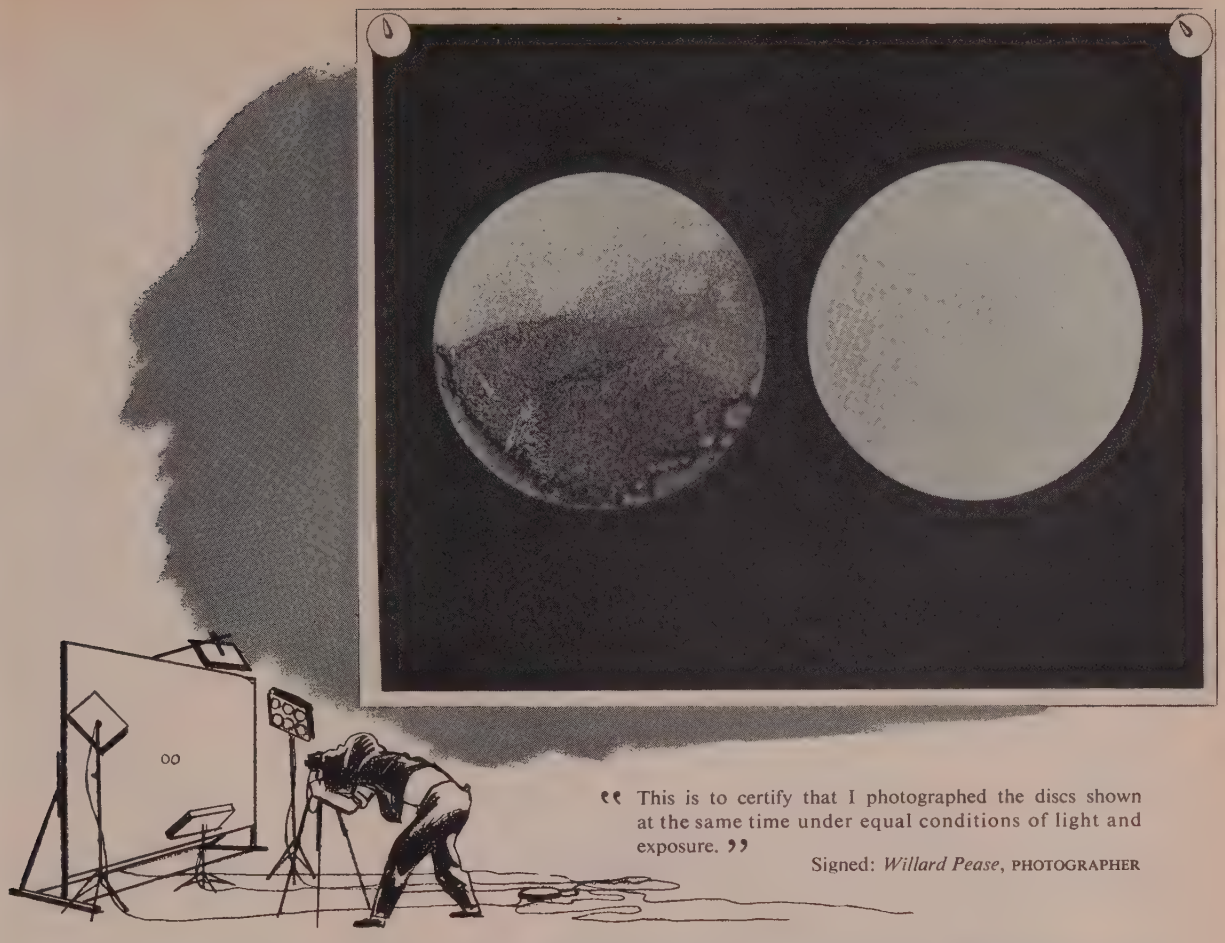
The Alstrip roofing system, a New Zealand development which has been in use there for the past 10 years, has been applied successfully to a school in England. The system, which involves aluminum sheet, was introduced into the United Kingdom last year by Verity & Gard'ner Limited of Northampton, who manufacture the roofing material from special alloy sheet supplied by Northern Aluminium Co. Ltd., Banbury, Oxfordshire.

The feature of the Alstrip system is that the aluminum is transported to the site in 18-inch wide coils, each weighing about 450 lb. The metal is formed from these coils by a mobile machine into 14-inch wide trays of the length required for a particular roof, or part of a roof. Each tray forms a continuous strip from the ridge to the gutter, or gutter to gutter, of the building and as each tray is laid it is secured to the roof decking by special clips. The next tray is then laid and the lips of the two trays are lock seamed together by special machines to form a watertight joint. The trays can be laid very speedily, there are no horizontal lap joints, the surface of the roof is free from visible fixings, and expansion and contraction can take place.

The roof needs a minimum pitch of only two inches in 10 feet and this, coupled with the fact that uninterrupted trays up to 45 feet long can be produced, makes it an ideal system for low-pitch gable and lean-to roofs.

By using aluminum a pleasing appearance is obtainable coupled with great durability, costs and weight are lower than for other comparable methods of roof covering and the natural resistance of aluminum to corrosion makes painting or other protective measures unnecessary and lowers maintenance costs. Aluminum also has good reflective thermal insulation properties which conserve fuel in the winter and ensure increased comfort in summer.

Widespread interest has already been shown in this new system which combines both technical and aesthetic properties so succesfully.



"This is to certify that I photographed the discs shown at the same time under equal conditions of light and exposure."

Signed: *Willard Pease*, PHOTOGRAPHER

A PICTURE IS WORTH 1,000 WORDS!

The above photograph clearly shows that the disc at the right, which was coated with Kerns Kleen Strip© 485 Aluminum Rolling Oil, has no stain whatsoever and is twice as bright as the disc at the left which was coated with a commonly used product.

Both aluminum plates were tested and photographed under the same conditions. They were heated for 30 minutes at 650° F., then photographed with the same camera, light, distance and lens settings.

See the difference in aluminum finish in your own rolling operation . . . test Kerns Kleen Strip© 485. We will supply material . . . no formal invoice rendered unless completely approved in production.

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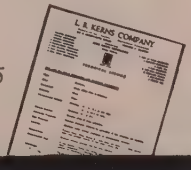

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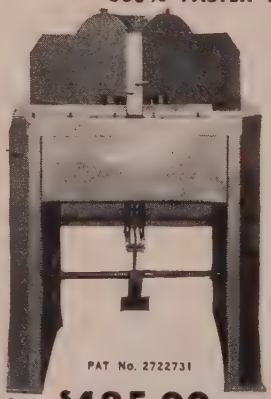

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Seamless, Weldless Chains Being Cast in Aluminum

Bison Aluminum Chain Co., 249 Hertel Ave., Buffalo, N. Y., is producing a one-piece weldless cast chain that is claimed to be dimensionally and structurally uniform, non-corroding, non-magnetic, non-sparking and explosion proof.

Each link is molded smooth and uniform. Grain structure is the same at any cross section because there is no crystallization due to welding or forming. A combination of special alloys yields tensile strengths of 20,000 to 40,000 psi.

Designed for a wide range of industrial, commercial and consumer applications, the chain is used ornamentally and functionally in chemical, food processing, textile, petroleum, plastics and aluminum reduction plants. Applications include chain ladders, anchor chains, guard and ornamental rails, swings and chain falls.

Stock sizes (cross-section diameter) are ¼, 9/32, and ⅜ inch (long link), and ½, ⅞ and 1 inch (stud links). Other fittings, repair links, etc., are also offered for these sizes. Initial costs start at $1.50 per lineal foot, with savings realized by elimination of maintenance.

Nat'l Distillers Forms Big Special Metals Firm

In a move to broaden its activities in the field of special metals, National Distillers and Chemical Corp., New York, has acquired a 60% interest in the common stock of Mallory-Sharon Metals Corp. — in which National already owns a one-third interest — and will integrate with it the operations of its subsidiary, Johnston & Funk Metallurgical Corp., which is devoted to the manufacture of titanium wire.

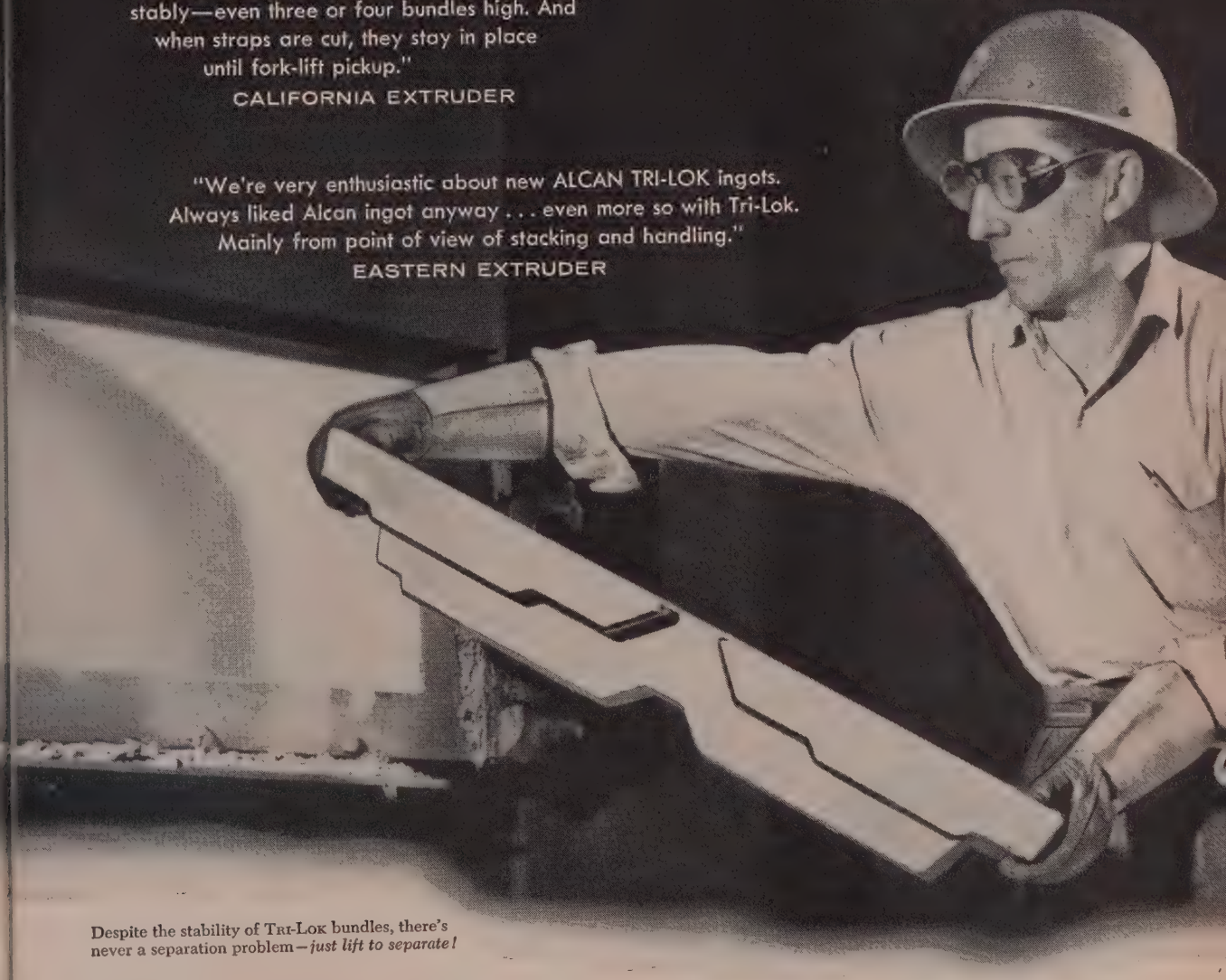
The combined operation will be known as Reactive Metals Inc., with headquarters in Bridgeport, Conn., and

"Very pleased with all the advantages offered by Tri-Lok. Always prefer shipments to be made in this form due to handling ease, safety and convenience."
NEW YORK SMELTER

"TRI-LOK ingots cut our unloading time quite a bit. They don't shift in bundles . . . but stay in place for easy storing and fork-lift handling."
MIDWEST ALUMINUM PRODUCTS MANUFACTURER

"ALCAN TRI-LOK ingots arrive compact and stay compact until we use them. They stack safely, stably—even three or four bundles high. And when straps are cut, they stay in place until fork-lift pickup."
CALIFORNIA EXTRUDER

"We're very enthusiastic about new ALCAN TRI-LOK ingots. Always liked Alcan ingot anyway . . . even more so with Tri-Lok. Mainly from point of view of stacking and handling."
EASTERN EXTRUDER



Despite the stability of TRI-LOK bundles, there's never a separation problem—*just lift to separate!*

Here are some typical examples of what users are saying about Aluminium's newest ingot development—ALCAN TRI-LOK ingot.

Designed for more efficient handling, the new ingots lock one to another, not in just one, but in three different ways. The resultant stability means greater speed, simplicity and safety wherever ingots are handled.

In car unloading, you find bundles arrive in excellent condition ready for quick pickup by fork lift truck. In-plant moves, too, are greatly simplified because no pallets or special slings are needed. Even after strap removal, TRI-LOK bundles remain securely intact on trucks, floors or inclined ramps.

See for yourself how TRI-LOK ingots improve worker safety . . . save time in carrying, storing and remelt charging. Just telephone or write us today.

Aluminium Limited

ALCAN

Ingot Specialist...serving American Aluminum Fabricators—
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will be one of the largest producers of zirconium and titanium mill products and columbium, hafnium, molybdenum, tantalum, tungsten and vanadium mill products.

The contract under which Bridgeport Brass Co. has been managing Mallory-Sharon Metals will be revised to cover operation of Reactive Metals Inc. Bridgeport's option to acquire part ownership of the old company will now apply to Reactive Metals. At the end of its five-year management contract, Bridgeport plans to exercise its option to buy a substantial portion of the new company.

In making the announcement, John E. Bierwirth, Chairman, and Roy F. Coppedge, Jr., president of National Distillers, said that Austin R. Zender, chairman of Mallory-Sharon Metals and president of Bridgeport Brass Co., will continue as chairman and chief executive officer of the new company. New president and director of Reactive Metals will be Raymond A. Quadt, vice president for research and development at Bridgeport Brass.

"Mr. Quadt has had 18 years of varied experience in the metal business," Bierwirth said. "Prior to his association with Bridgeport Brass he was director of aluminum development and a vice president of Hunter Douglas Corp. and before that research metallurgist with the American Smelting & Refining Co."

New Phone Booth Uses 26% Less Floor Space

A space saving aluminum telephone booth is a new development of Aluminum Co. of America. It is considered ideal for multiple installations in high traffic areas and should enable telephone companies to greatly increase their service locations. Like its outdoor counterpart, the familiar Alcoa Outdoor Telephone Booth, it utilizes interchangeable replacement parts.

"This new compact booth provides convenient service with complete privacy and visibility in places no booth ever fitted before," said Charles Braglio, sales manager for Alcoa telephone booths.

"Just 28¾ inches square, it takes 26% less area than its big brother—saves valuable floor space in super markets, drug stores, and other busy locations. Its rugged construction makes it suitable for many outdoor installations."

The booth is fabricated of high-strength, corrosion-resistant aluminum. The Alumilite finish never needs painting. Pencil marks or smudges wash off easily with soap and water.

The new booth features a flush roof, an aluminum alloy patterned floor, a self-closing door assembly, shelf, and interior wiring for fluorescent lighting to give ample illumination. A ceiling vent fan and louvered bottom panels are optional equipment.

Alcoa to Double Coated Sheet Capacity

Alcoa is constructing two new paint lines within existing buildings of its Davenport, Ia., mill so as to double production capacity of enamel-coated aluminum sheet. Both units are scheduled for completion later this year.

Two new roller-coaters will produce enamel-coated sheet in widths up to 48 inches.

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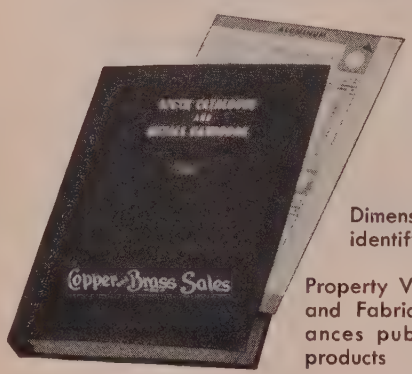
R.W.M.A. COPPER ALLOYS — STAINLESS STEEL



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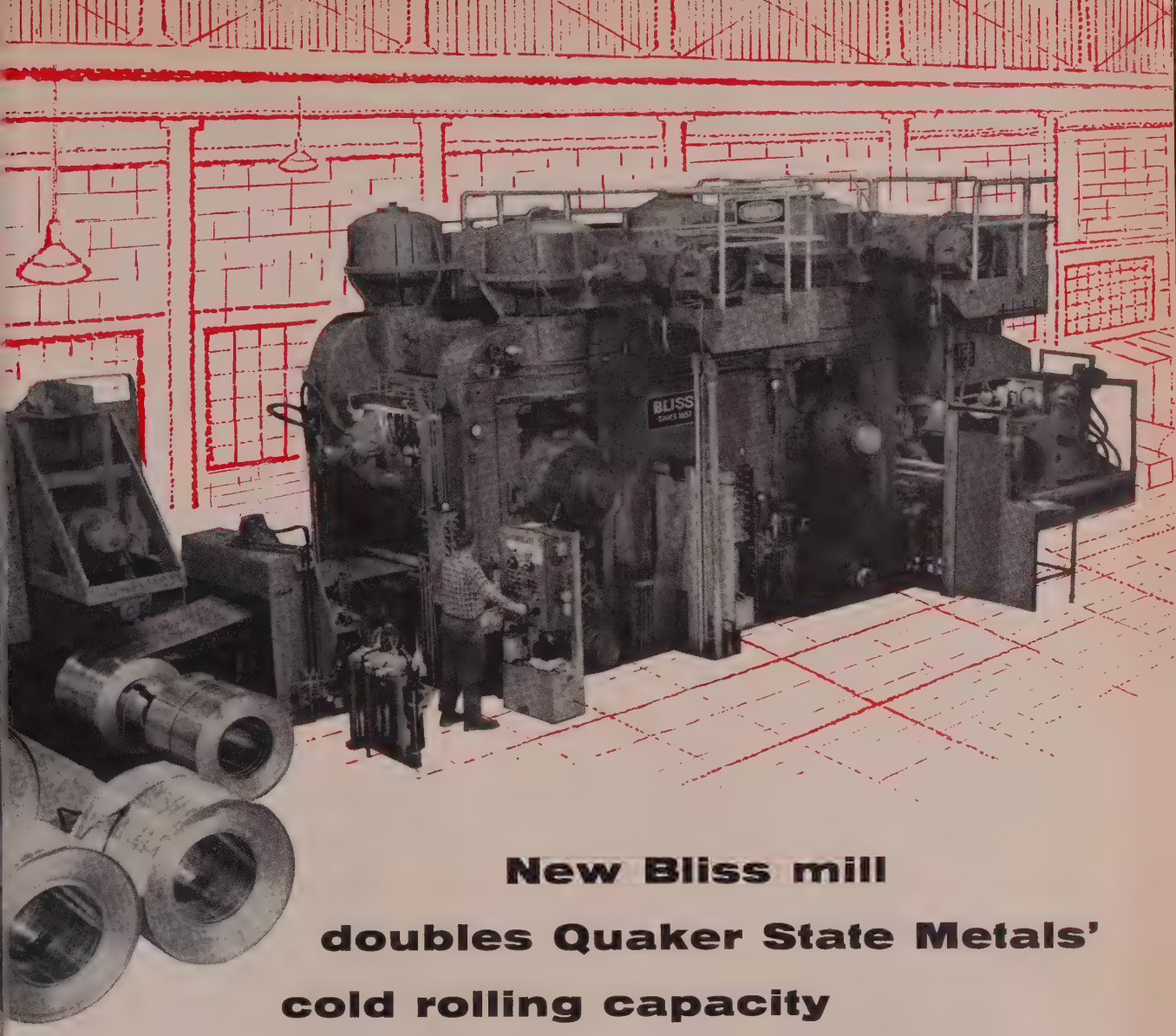


New Bliss mill doubles Quaker State Metals' cold rolling capacity

With a rolling capacity now approaching 10 million pounds a month, Quaker State Metals Company of Lancaster, Pa., division of Howe Sound Co., ranks as one of the largest independent rollers of aluminum in the United States.

A new Bliss tandem mill is a key unit in Quaker State's recently completed expansion program. In production a week after its erection was completed, the mill has more than doubled the plant's cold rolling capacity.

It reduces strip from .250 inch to .062 inch in a single pass. Delivery speed is 1500 fpm. Coil handling is completely mechanized, utilizing a coil opener equipped with a peeler knife and an automatic guide control.

Whether your own plans call for the addition or modernization of a single unit or a complete rolling plant, you'll find that the Bliss Rolling Mill Division can help you with the problems you may encounter. For examples of Bliss installations for rolling both ferrous and non-ferrous materials, write for our 84-page Bulletin 40-B.

BLISS SINCE 1857 ®

Bliss is more than a name . . . it's a guarantee

E. W. BLISS COMPANY, Rolling Mill Division, Salem, Ohio

Subsidiary: The Matteson Equipment Company, Inc., Poland, Ohio

Men-on-the-move

Marshall R. Rogers has been elected president of Rogers Industries, Inc., Detroit, formerly Winter Seal Corp., manufacturer of aluminum doors, windows and industrial extrusions. He succeeds **Don Rogers,** a founder of the company, who has been named chairman of the board. The board also elected **Joseph T. Rosenberg** executive vice president; **John G. Sullivan,** vice president, manufacturing; **Arthur W. Steinberg,** vice president, sales; and **Joseph H. Jackier,** member of the board of directors.

Kenneth J. Boedecker has been appointed to the newly created position of manager, aluminum structures market of Reynolds Metals Co. The structures market was formed to further promote the increasing use of aluminum structurals. Boedecker joined Reynolds as an industrial engineer in 1954 and soon was promoted to chief standards engineer at the company headquarters in Richmond.

Willard Roth is the new assistant chief engineer for industrial furnaces and equipment of the Sunbeam Equipment Corp., Meadville, Pa. He was manager of engineering for the industrial division of Lindberg Engineering Co., Chicago.

Anaconda Aluminum Co. has named **Nathan G. Everett** plant manager of its Terre Haute, Ind., aluminum sheet and extrusion plant. For the past 15 years Everett has been plant manager of the Louisville foil and sheet rolling plant. He has been succeeded by his former assistant **John M. Shepherd.**

J. A. Bauscher has joined the Lee Wilson Engineering Co., industrial furnace builders, Cleveland, as vice president in charge of research. Bauscher was with U. S. Steel Corp. where he was chief of the Sheet Products Div'n of the Applied Research Laboratory.

R. Perry Kilsby has been named a vice president of the Republic Supply Co. of California, Los Angeles, distributor of metals, industrial and water works supplies, pipe, tubing and oil field equipment. He retains his position as president of Kilsby-Tubesupply.

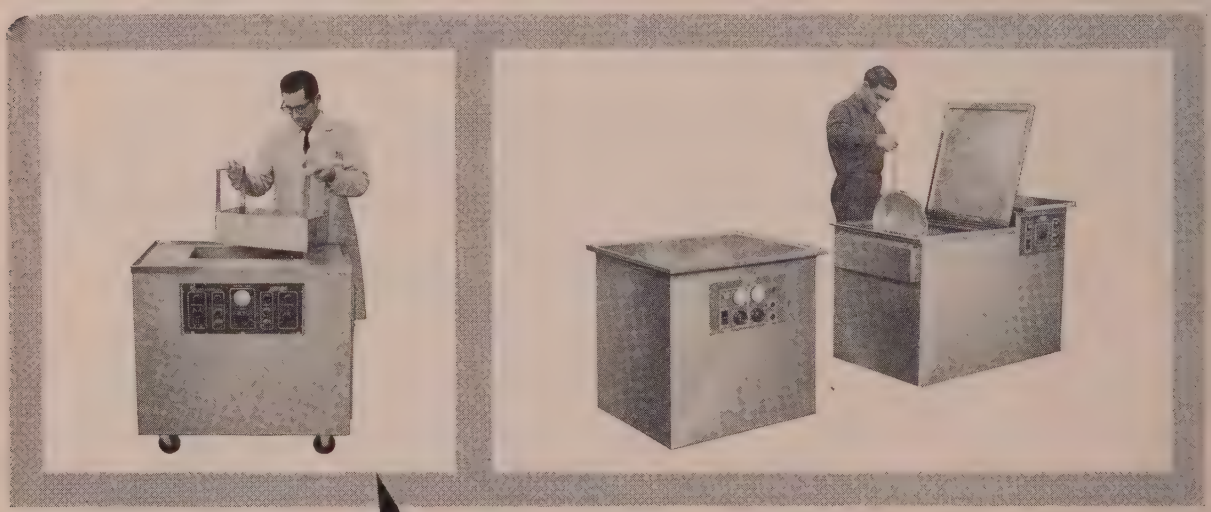
W. C. Fobbe has been named sales manager of Permanent Mold Die Co., PMD Extrusion Die Co., Piston Mold Die Co. and Permanent Machine Division. He was previously with Alcoa and Bohn Aluminum & Brass Corp.

Edwin J. Mejia, vice president and chief sales management officer of Aluminium Limited, has been appointed a senior vice president. He succeeds **R. E. Powell,** now honorary chairman of Aluminium's principal subsidiary, Aluminum Co. of Canada Ltd. Mejia has been with Limited since its formation in 1928.

T. E. Goodyear has been appointed sales manager of the St. Louis District for Wolverine Tube, Div'n of Calumet & Hecla Inc. He will direct sales of aluminum tube and extruded shapes and copper in Nebraska, Kansas, Missouri, Kentucky, Illinois and parts of Indiana, Iowa and South Dakota. Goodyear replaces **T. F. Vigmostad,** who has been reassigned to sales manager of the New York District.

The E. W. Bliss Co. has realigned the responsibilities of some officers. **A. S. Burgoyne,** formerly vice president of manufacturing, has been appointed to the newly created position of vice president and manager of the company's Press and Die Supply Div'n. **Einar W. Sundberg,** formerly vice president, treasurer and secretary of the Gamewell Co., a Bliss subsidiary, is now treasurer of the parent company.

(*Continued on page 94*)



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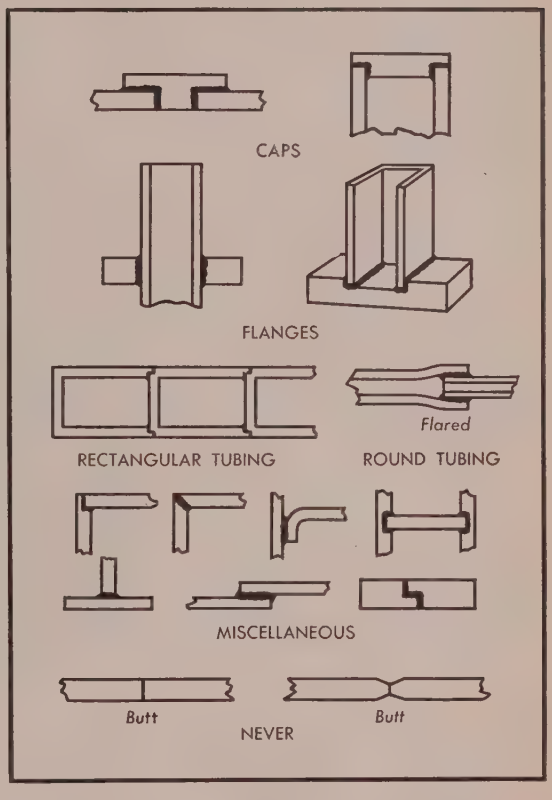
From Park Research Laboratories

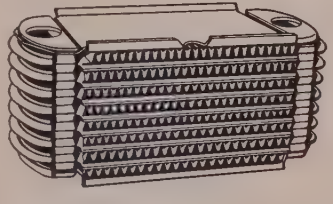
Aluminum Brazing in Salt Baths

Dip brazing of aluminum parts has developed to the point where such operations are on a production basis. Aluminum brazing in salt baths is now widely used in the fabrication of such items as heat exchangers, wave guides, refrigerator evaporators, fuel tanks and aircraft parts.

Dip brazing in molten salt is the most effective, practical and economical method of joining aluminum in many cases. Aluminum of extremely thin gage can be handled without damage from pitting or distortion. Tensions are spread evenly along the joints as opposed to stress points formed by spot welding or riveting. Joints produced by the brazing of aluminum parts are as strong as those produced by any other method. Thousands of inaccessible joints in a single unit can be handled by the dip brazing method. Increased production rates and reduced scrap losses lower unit costs.



THE HEAT EXCHANGER—A GOOD EXAMPLE



The heat exchanger, assembled from alternate corrugated and formed aluminum sheets, is a good example of the type of work handled advantageously by dip brazing. Thousands of lineal feet of perfect joints were made simultaneously in the part shown.

MANY ADVANTAGES OFFERED

Among the many advantages offered by salt brazing of aluminum are:

Minimum distortion because of uniform heating, close temperature control and the buoyancy of the molten brazing salt.

Savings in floor space and equipment since molten salt is 4 to 6 times faster than conventional furnaces and long cooling chambers are eliminated.

Assemblies of various sizes and shapes can be brazed simultaneously.

All joints are brazed at one time although selective brazing is possible.

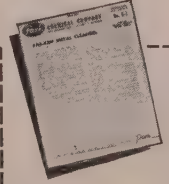
ESPECIALLY APPLICABLE TO JOINT DESIGN AND FIXTURES

The close tolerances required of aluminum microwave components can be satisfied by dip brazing. Aluminum manufacturers' literature contains designs for self-locating joints and proper clearances. Use of these joint designs eliminates elaborate fixtures and costly assembling. Joint designs suitable for dip brazing aluminum parts are illustrated above.

PARK ALUMINUM BRAZING SALTS OFFER SUPERIOR QUALITIES

Park Aluminum Brazing Salts are superior to other fluxes because of their better fluidity, greater stability, freedom from sludge and ease of cleaning. They act as both flux and heat transfer medium for all dip brazing operations on aluminum alloys. Joints can be made by using wire rings, flat shims or with brazing sheet.

For detailed information on Park Aluminum Brazing Salts and their application, send coupon for technical bulletins. Samples for experimental treatment may be submitted, if desired. Send to PARK CHEMICAL COMPANY, 8074 Military Avenue, Detroit 4, Mich.



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To help you know the line and select the alloy and flux best suited for each job, All-State publishes a 56-page INSTRUCTION MANUAL, free to interested users. Also, a special ALUMINUM MANUAL containing 36 pages of data on aluminum alloys and how to join them. If you work with aluminum, ask for a copy.

To serve you, All-State maintains 3 factories, 4 warehouses (White Plains, N. Y.—St. Louis, Missouri — South Gate, California — Toronto, Ontario, Canada) and a central Technical Department and Laboratory at headquarters.

ALL-STATE WELDING ALLOYS CO., INC.
WHITE PLAINS, NEW YORK

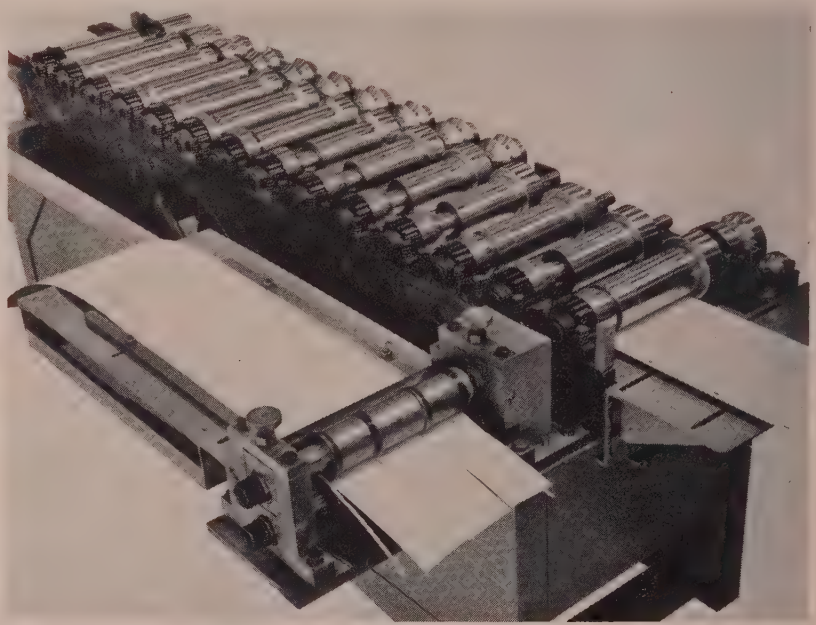
Samuel L. Fahnestock has been named manager of design for Aluminum Co. of America. In this new position he will coordinate design assistance programs for manufacturers and designers, and head the company's internal corporate design efforts. He will also be responsible for the industrial design department, which he headed, and a proposed new graphic design group.

Appointment of **Edward F. Rau** and **Gerald A. Beebe** as Roll-Bond sales engineers in the Metals Div'n of Olin Mathieson Chemical Corp. was recently announced. Rau has been assigned to the St. Louis territory and will headquarter at the firm's East Alton, Ill., plants. He replaces **Charles O. Kunz**, now Roll-Bond manager. Beebe has been assigned to the Dayton, Ohio, office.

U. N. Alloy Steel Corp., Boston, has appointed **Richard L. Duncan** product manager of the company's hot work tool steel division. He will direct metallurgical research and development of new alloys as well as tooling engineering services for the extrusion industry.

Alcoa International Inc., New York, a wholly owned subsidiary of Aluminum Co. of America, has announced the promotion of two top officials. **John W. Wilson** has been elected to the corporation's board of directors and designated vice president and general manager. **O. V. Peterson,** manager of operations, was elected a vice president.

Latrobe Steel Co., Latrobe, Pa., producers of die steels for extruders and other metalworking firms, has appointed **Joseph W. Collier** chief industrial engineer. Collier comes to Latrobe from Pittsburgh Plate Glass Co.



14-Station Roll Former Produces Building Components

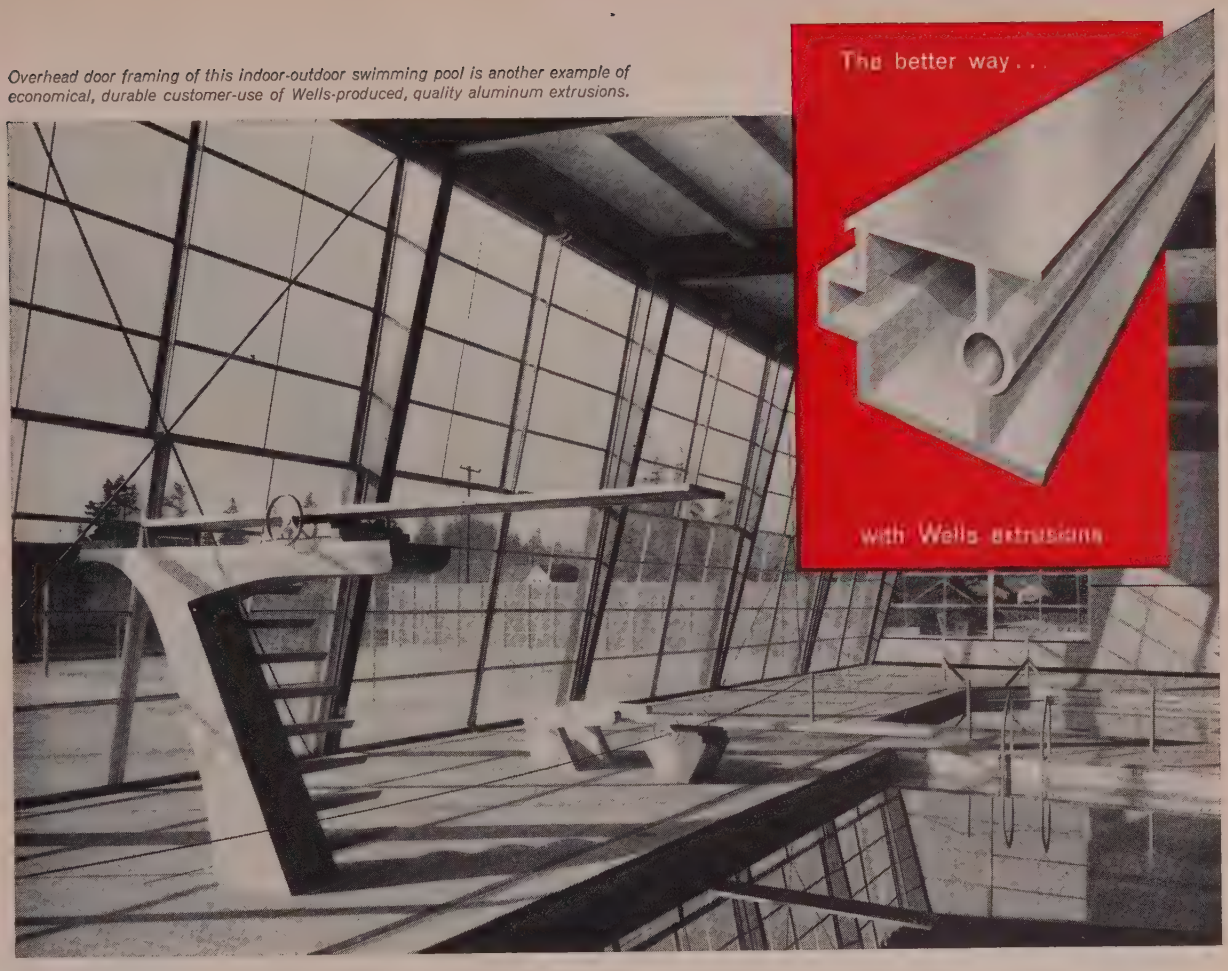
A special 14-station roll forming machine has been designed by The Lockformer Co., 4615 W. Roosevelt Road, Chicago, for high production of basic parts in the aluminum siding industry. The tool will roll form clapboard aluminum siding at the rate of 60 to 65 fpm., normal speed, with other speeds optional. Auxiliary shafts included can be set up with roller dies to run, for example, the W-section or inside corner used as trim by the industry.

On the inboard side, special rolls on 14 stations fabricate the entire 8-inch aluminum siding panel, pre-punching the elongated nailing slots and the weep holes in the bottom section. For this finished width, stock material approximately 10-3/8 inches wide in .032 in. or .025 in. thickness is used. Roller dies are chrome plated to handle the precoated material.

The new machine is equipped with heavy duty / production bearings and steel transmission system. Power is from a 7½ hp., 1800 rpm., 220/440 volt, 3 phase, 60 cycle motor.

Optional is a 13 inch slitting attachment which can be driven from the basic machine. It has knife and blade adjustments for various widths as well as for blade depth. This enables buying one size stock and slitting down to any given size for component width requirements.

Overhead door framing of this indoor-outdoor swimming pool is another example of economical, durable customer-use of Wells-produced, quality aluminum extrusions.



The finest extrusions demand more than the ordinary

Our biggest asset is the ability to achieve consistently high quality extrusions . . . and, like anything worthwhile, it takes a lot of careful attention to detail. The almost microscopic check of die surfaces and dimensions to detect even the slightest flaw . . . painstakingly controlled temperatures and pressures . . . gentle, precision material handling . . . tough inspection—these are the things that bring our product out of the *ordinary* and into the true category of *custom* extrusions.

Look to Wells also for the fastest, most up-to-date extrusion facilities . . . on-schedule delivery by Wells trucks (or by rail or air) . . . expert engineering assistance. Whatever your aluminum extrusion requirements, you can depend on Wells to do the job better, faster, more economically! Write today for details on the new Wells extrusion facilities, including complete fabrication facilities.

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Millions of *your* customers will see the advertising and promotion Alcoa conducts to help you "cook up a better batch of profits"! Whether you fabricate Alcoa® Aluminum cookware, hardware or boats . . . sporting goods, furniture or major appliances, there's an Alcoa Market-Maker promotion to help you sell your product.

Here is just a partial list of avenues used by Alcoa to help you sell. Alcoa TV commercials appear regularly on two network TV programs. Radio is used to reach customers when they aren't watching television. Magazines—both consumer and trade—and many other promotional tools for industry support and direct customer support to help you sell your products. There is an element in Market-Maker promotions that will fit your particular selling need.

Brand-conscious consumers know and respect the Alcoa label. And alert retailers constantly feature the label in their advertising and in-store displays to tell customers about the benefits of aluminum products.

If you aren't already making full use of Alcoa Aluminum in your manufacturing operations—or would like more information about Market-Maker promotions and Alcoa's label program, here's your invitation—write Aluminum Company of America, 2076-F Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

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ALUMINUM COMPANY OF AMERICA

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MATERIALS

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Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridegport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Kawneer Company
Mill Products Div.
St. Charles, Ill.

North American Extrusions Corp
5569 N. Riverview Drive
Kalamazoo, Mich.

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

Southern Extrusions Co.
North Washington Street
Magnolia, Arkansas

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

BAR AND ROD

Aluminium Limited Sales, Inc
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa (Al)

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

William L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Corson Industries
Delair, N. J.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan (Al&Mg)

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio (Al)

Harvey Aluminum
Torrance, Calif. (Al)

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co
Davenport, Iowa (Al)

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Connecticut

Southern Extrusions Company
North Washington Street
Magnolia, Arkansas (Al)

Superior Industries, Inc.
3786 Oakwood Ave.
Youngstown, Ohio

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

BILLET, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum & Magnesium, Inc.
Sandusky, Ohio

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19. Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Apex Smelting Company
2557 West Taylor Street
Chicago 12, Illinois

Corson Industries
Delair, N. J.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Superior Industries, Inc.
3786 Oakwood Ave.
Youngstown, Ohio

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

BILLET, MAGNESIUM

The Dow Chemical Co.
Magnesium Department
Midland, Michigan

BRAZING SALTS, ALUMINUM

Heatbath Corp.
Springfield 1, Mass.

Park Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

BRAZING SUPPLIES

Lucas-Milhaupt Engineering Co
5040 S. Lake Drive
Cudahy, Wisconsin

BUFFS

Allied Research Products, Inc.
4004 E. Monument St.
Baltimore 5, Md.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

BUS CONDUCTOR, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

CASTINGS, ALUMINUM DIE

Allen-Stevens Corp.
33-53 62nd St.
Woodside, N. Y.

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

The Dow Metal Products Co.
Div'n Dow Chemical Co.
Midland, Mich.

Federal Die Casting Company
2226 North Elston
Chicago, Illinois

CASTINGS, MAGNESIUM DIE

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

CASTINGS, ALUMINUM, SAND AND PERMANENT MOLD

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa (Al)

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

CASTINGS, MAGNESIUM, SAND AND PERMANENT MOLD

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa

The Dow Metal Products Co
Div'n, Dow Chemical Co
Midland, Michigan

CIRCLES, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Co.
Fairmont, W. Va.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

CLEANERS, ALUMINUM

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Amchem Products, Inc.
Ambler 12, Pa.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, New Jersey

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co
9310 Roselawn Ave
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector Street
New York 6, N. Y.

Parker Rust Proof Co
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

CO_2 for CASTING

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

COATINGS, ELECTRICALLY CONDUCTIVE

Amchem Products, Inc.
Ambler 12, Pa.

Grafo Colloids Corp.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

COIL, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

COIL ALUMINUM (CONT.)

Fairmont Aluminum Company
Fairmont, West Virginia

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

LaPointe Industries Inc.
Rockville, Conn.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Connecticut

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

COILS, PRE-ANODIZED

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

Fairmont Aluminum Co.
Fairmont, West Virginia

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

COILS, PRE PAINTED

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
Aluminum Division
Bridgeport 2, Conn.

Fairmont Aluminum Co.
Fairmont, West Virginia

Litho-Strip Corp.
4800 S. Kilbourn Ave.
Chicago 32, Ill.

Pre Finish Metals Inc.
2110 E. Pratt Blvd.
Elk Grove, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

COMPOUNDS, BARREL FINISHING

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

COMPRESSED GASES

Liquid Carbonic Div.
General Carbonic Corp.
135 S. LaSalle St.
Chicago 3, Ill.

CONVERSION COATING, ALUMINUM

Allied Research Products, Inc.
4004 E. Monument St.
Baltimore 5, Md.

Amchem Products, Inc.
Ambler 12, Pa.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Philadelphia 2, Pa.

DETERGENTS

MacDermid Inc.
Waterbury 20, Conn.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

DIE STEELS FOR DIE CASTING

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

U.N. Alloy Steel Co.
365 Dorchester Ave.
Boston 27, Mass.

DIE STEEL, EXTRUSION

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

U.N. Alloy Steel Co.
365 Dorchester Ave.
Boston 27, Mass.

DISPERSIONS, COLLOIDAL-GRAPHITE

Grafo Colloids Co.
259 Wilkes Pl.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

DRAWING COMPOUNDS, METAL AND WIRE

Grafo Colloids Corp.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

DYES, ANODIZING

Carbic-Hoechst Corp.
451 Washington St.
New York 13, N. Y.

Koppers, Inc.
Chemicals & Dyestuffs Div.
Porter Building
Pittsburgh 19, Pa.

ELECTRODES FOR WELDING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

ENAMELS, PORCELAIN ALUMINUM

Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

ETCHANT, ALUMINUM

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Amchem Products, Inc.
Ambler 12, Pa.

Frederick Gumm Chemical Co
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EXTRUSIONS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Benson Aluminum Co., Inc.
621 Virginia St.
Connersville, Ind.

William L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Kawneer Company
Mill Products Div.
St. Charles, Ill.

Midwest Aluminum Corp.
7696 W. Michigan Ave.
Kalamazoo, Mich.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Olin Aluminum
400 Park Avenue
New York 22, New York

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14757 Meyers Road
Detroit 27, Mich.

Southern Extrusions Co.
North Washington Street
Magnolia, Arkansas

Superior Industries, Inc.
3786 Oakwood Ave.
Youngstown, Ohio

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

EXTRUSIONS, IMPACT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif

EXTRUSIONS, IMPACT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

EXTRUSIONS, TITANIUM

Bridgeport Brass Company
Aluminum Division
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

FASTENERS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburg 19, Pa.

Southern Screw Company
Statesville, North Carolina

FENCING, ALUMINUM

Nichols Wire & Aluminum Co.
Davenport, Iowa

FILLER METAL, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

FILLER METAL, MAGNESIUM

All-State Welding Alloys
249-55 Ferris Ave.
White Plains, N. Y.

FINISHES AND COATINGS, ALUMINUM

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Amchem Products, Inc.
Ambler 12, Pennsylvania

De Soto Chemical Coatings, Inc.
1350 S. Kostner Ave.
Chicago 23, Ill.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Eastman Chemical Products, Inc.
Kingsport, Tennessee

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Sherwin-Williams Co.
Cleveland 1, Ohio

FLUXES, ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Federated Metals Div.
American Smelting & Refining Corp.
120 Broadway
New York 5, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

FLUX, ALUMINUM SOLDERING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

FLUX, BRAZING

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

FLUX, WELDING

All-State Welding Alloys Co. Inc.
249-55 Ferris Ave.
White Plains, N. Y.

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

FLUXES, MAGNESIUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

FOIL, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P.O. Box 1654
Louisville 1, Ky.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 West Broad St.
Richmond 18, Va.

FOIL, ALUMINUM, PREANODIZED

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

FORGINGS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn. (Al, Ti)

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Scovill Manufacturing Co.
99 Mill St.
Waterbury, Conn.

Wyman-Gordon Company
Worcester 1, Mass. (Al, Mg, Ti)

FORGINGS, COLD, NO-DRAFT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

FORGINGS, EXTRUSION, TOOL

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

FORGINGS, IMPACT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

FORGINGS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Bridgeport Brass Co.
Aluminum Division
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

Wyman-Gordon Company
Worcester 1, Mass. (Al, Mg, Ti)

FORGINGS, TITANIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

Wyman Gordon Company
Worcester 1, Mass.

FRIT FOR ALUMINUM

Ferro Corp.
4150 E. 56th St.
Cleveland 5, Ohio

HARDWARE, DOOR, WINDOW

Allen-Stevens Corp.
33-53 62nd St.
Woodside, N. Y.

Cipco Corporation
22nd & Cole Streets
St. Louis 6, Mo.

HEAT TREATING SALTS, ALUMINUM

Heatbath Corp.
Springfield 1, Mass.

HIGH PURITY ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Kaiser Aluminum & Chemical Corp.
Kaiser Center
Oakland 12, Calif.

HINGES, ALUMINUM

Lake Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

INGOT, ALUMINUM (ALLOYS)

Alloys & Chemicals Mfg. Co., Inc.
4365 Bradley Rd., S.W.
Cleveland 9, Ohio

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum & Magnesium, Inc.
Sandusky, Ohio

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Federated Metals Div. ASARCO
120 Broadway
New York 5, N. Y.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

INGOT, MAGNESIUM (ALLOYS)

Alloys & Chemicals Mfg. Co., Inc.
4365 Bradley Rd., S.W.
Cleveland 9, Ohio

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

The Dow Chemical Co.
Magnesium Department
Midland, Michigan

INGOT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

IRRIGATION PIPE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

LUBRICANTS, CASTING

Acheson Colloids Co.
Div. Acheson Industries, Inc.
Port Huron, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Scott Chemical Corp.
510 W. Garfield
Glendale 4, Calif.

LUBRICANTS, EXTRUDING

Acheson Colloids Co.
Div. Acheson Industries, Inc.
Port Huron, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

Imm Products Co.
P. O. Box 144
Lansing, Ill.

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Scott Chemical Corp.
510 W. Garfield
Glendale 4, Calif.

LUBRICANTS, FORGING

Acheson Colloids Co.
Div. Acheson Industries, Inc.
Port Huron, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Scott Chemical Corp.
510 W. Garfield
Glendale 4, Calif.

LUBRICANTS, METALWORKING

Acheson Colloids Co.
Div. Acheson Industries, Inc.
Port Huron, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Scott Chemical Corp.
510 W. Garfield
Glendale 4, Calif.

MAINTENANCE MATERIALS, PAINT SPRAY BOOTH

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

NAILS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

NUTS

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

PARTING COMPOUNDS

Grafo Colloids Corp.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

PIG, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

PIPE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

PLASTIC CAPS, INSERTS

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLASTIC GLIDES, RUNNERS FOR WINDOWS, DOORS, SCREENS

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLATE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Fairmont Aluminum Company
Fairmont, West Virginia

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Rockingham Road
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

PLATE, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

PLATE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

POLISHING, BUFFING COMPOUNDS

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

POLISHING, CHEMICAL

Alchemize Corporation
1431 South Talman Avenue
Chicago 8, Illinois

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

REFRACTORY PRODUCTS

Babcock & Wilcox Corp.
Refractories Div.
161 E. 42nd Street
New York 17, N. Y.

Harbison-Walker Refractories Co.
Farmers Bank Building
Pittsburgh 22, Pa.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

H. K. Porter Co., Inc.
Porter Bldg.
Pittsburgh 19, Pa.

Refractory Products Co.
910 Custer Ave.
Evanston, Ill.

RIVETS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

ROD AND BAR, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

ROD, BRAZING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Nichols Wire & Aluminum Co.
Davenport, Iowa

ROD, WELDING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Buildings
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

SCREEN WIRE, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

SCREEN WIRE, ALUMINUM, ANODIZED

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

SCREWS, MACHINE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Southern Screw Company
Statesville, North Carolina

SCREWS, TAPPING, ALUMINUM

Southern Screw Company
Statesville, North Carolina

SCREWS, WOOD, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Screw Company
Statesville, North Carolina

SHAPES, ANODIZED

Aluminum Finishing Corp.
1012 E. 21st Street
Indianapolis, Indiana

SHAPES, ROLL FORMED

Nichols Wire & Aluminum Company
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

SHEET, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Company
Fairmont, West Virginia

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

SHEET, ANODIZED

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Aluminum Finishing Corp.
1012 E. 21st Street
Indianapolis, Indiana

City Plating & Polishing Co.
22nd & Cole Street
St. Louis 6, Missouri

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

Fairmont Aluminum Co.
Fairmont, West Virginia

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Extrusions, Inc.
North Washington Street
Magnolia, Arkansas

SHEET, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

SHEET, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

SOLDER, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

SPOOLED ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

STRIPPERS, METAL & PAINT

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

STRUCTURALS, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Willam L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

Southern Extrusions, Inc.
North Washington St.
Magnolia, Arkansas

TOOLING PLATE, ALUMINUM

Reynolds Metals Co.
6601 W. Broad St.
Richmond 18, Va.

TORCHES, WELDING, CUTTING

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

TREAD PLATE, MAGNESIUM

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

TUBED SHEET, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Olin Roll-Bond Division
East Alton, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Co.
6601 W. Broad St.
Richmond 18, Va.

TUBE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

William L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Kawneer Company
Mill Products Div.
St. Charles, Ill.

LaPointe Industries Inc.
Rockville, Conn.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Olin Aluminum
400 Park Avenue
New York 22, New York

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14572 Meyers Road
Detroit 27, Mich.

Southern Extrusions Company
North Washington Street
Magnolia, Arkansas

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

TUBE, MAGNESIUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

The Dow Metal Products Co.
Div. Dow Chemical Co.
Midland, Mich.

TUBE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

Wolverine Tube
Div. Calumet & Hecla Inc.
17200 Southfield Rd.
Allen Park, Mich.

VENETIAN BLIND STOCK

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

WIRE, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

WIRE, PRECISION SPOOLED, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Ave.
White Plains, N. Y.

WIRE DRAWING COMPOUNDS

Grafo Colloids Corp.
Sharon, Pa.

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EQUIPMENT

AIR QUENCHING EQUIPMENT, EXTRUSION

DeBothezat Fans Div'n
East Moline, Ill.

ANODIZING EQUIPMENT

The Gilbert Tramer Co
1217 Main
Cleveland, Ohio

BARREL FINISHING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

BEARINGS

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co.
Worcester, Mass.

BELT GRINDERS, ABRASIVE

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

BENDER, TUBE AND BAR

Wallace Supplies Manufacturing
1808 W. Cornelia Ave.
Chicago 13, Ill.

BILLET CUTTERS

Loma Machine Manufacturing Co.
114 East 32nd Street
New York 16, New York

Stone Machinery Co., Inc.
Manlius, New York

BILLET HEATERS

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Granco, Inc.
317 32nd St., S.W.
Grand Rapids 8, Mich.

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

BUFFING & POLISHING EQUIPMENT

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

BURNERS, OIL, GAS

E. W. Bliss Company
Canton 10, Ohio

CASTABLES, REFRACTORIES

Babcock & Wilcox Corp.
161 E. 42nd Street
New York 17, N. Y.

CASTING EQUIPMENT, BILLET

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

CASTING MACHINES CONTINUOUS

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

COATING THICKNESS TESTER

Unit Process Assemblies, Inc.
53-15 37th Ave.
Woodside 77, New York, N. Y.

COLD DRAW EQUIPMENT

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

COLD DRAWING MACHINE, CONTINUOUS

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

CUTTING MACHINES

Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

DISTRIBUTORS AND JOBBERS

These firms warehouse most forms of aluminum—sheet, coil, rod, tube, extrusions, etc.—and are located in all major industrial areas.

Aluminum Mill Supply Corp.
42-44 Court Street
Brooklyn 1, N. Y.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Atlantic Aluminum & Metal Distributors, Inc.
Page Boulevard
Springfield, Massachusetts

A. M. Castle & Co.
3400 N. Wolf Road
Franklin Park, Ill.

Chase Brass & Copper Co.
Waterbury 20, Conn.

T. E. Conklin Brass & Copper Co., Inc.
54 Lafayette St.
New York 13, N. Y.

Copper & Brass Sales, Inc.
6555 E. Davison
Detroit 12, Mich.

Peter A. Frasse and Company
17 Grand Street
New York, N. Y.

Fromson Orban Co., Inc.
261 Madison Ave.
New York 16, N. Y.

J & L Steel Warehouse Div.
545 W. McCarty
Indianapolis 5, Ind.

E. M. Jorgensen Company
10650 South Alameda
Los Angeles, California

Perry Kilsby, Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

A. B. Murray Co., Inc.
P. O. Box 476
Elizabeth, N. J.

Precision Steel Warehouse, Inc.
3500 North Wolf Road
Franklin Park, Illinois

Production Metals, Inc.
299 Pavonia Ave.
Jersey City 2, N. J.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Joseph T. Ryerson & Son, Inc.
16th and Rockwell Streets
Chicago 80, Illinois

Whitehead Metals, Inc.
303 W. 10th St.
New York 14, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

Stone Machinery Co., Inc.
Manlius, N. Y.

Wallace Supplies Mfg. Co.
1808 W. Cornelia Ave.
Chicago 13, Ill.

CUTTING MACHINES, WIRE

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

CUT-OFF MACHINES

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

Stone Machinery Co., Inc.
Manlius, New York

Wallace Supplies Manufacturing Co.
1808 W. Cornelia Ave.
Chicago 13, Ill.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

DETWISTING MACHINES

Feller Engineering Co.
1159 Empire Building
Pittsburgh 22, Pa.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

DIE CASTING MACHINES

Como-Cast Corp.
Subs. Basic Products Corp.
3002 West Burleigh
Milwaukee 1, Wisconsin

B & T Machinery Co.
Div. Greenlee Bros. & Co.
217 W. Eighth St.
Holland, Mich.

Cast-Master
Div. of Koehring Co.,
Hydraulic Press Mfg. Div.
23901 Aurora Road
Bedford, Ohio

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

DIE HEATERS

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio

The Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio

DIES, DIE CASTING

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

DIES, EXTRUSION

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Moczik Tool & Die Works
9511 Grinnell Avenue
Detroit 13, Michigan

PMD Extrusion Die Co.
5747 Beebe Ave.
Warren, Mich.

Superior Extrusion Tool & Die Company
56 S. Meridian Road
Youngstown 9, Ohio

DIES, NOTCHING

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

DIES, PERMANENT MOLD

Permanent Mold Die Co., Inc.
2375 E. 9-Mile Rd.
Hazel Park, Mich.

DIES, ROLL FORMING

American Roller Die Corp.
29501 Clayton Avenue
Wickliffe, Ohio

DIES, ROLL FORMING (CONT.)

Brunken & Goodwin Tool Engineering
7 North Second St.
Maywood, Ill.

Michigan Roll Form
8909 Hubbell
Detroit 28, Mich.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

DOCK BOARDS, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

DRAWBENCHES

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

DRYERS, STRIP & SHEET, CONTINUOUS

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

DUST COLLECTION UNITS

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

ELECTROPLATING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

EXTRUSION COILERS

Feller Engineering Co.
1159 Empire Building
Pittsburgh 22, Pa.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

EXTRUSION PRESSES

(See PRESSES)

EXTRUSION PRESS TOOLS

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

FILMS, X-RAY

Eastman Kodak Company
X-Ray Division
343 State Street
Rochester 4, New York

FOIL MILLS

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

United Engineering & Foundry Co.
Pittsburgh 22, Pennsylvania

FORMING MACHINES

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Yoder Co.
5539 Walworth Ave.
Cleveland 2, Ohio

FORMING ROLLS

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Avenue
Cleveland 2, Ohio

FURNACE CONTROL EQUIPMENT

Morgan Construction Co.
Worcester, Mass.

FURNACES, ANNEALING

Lee-Wilson Engineering Co.
20005 Lake Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

FURNACES, BRAZING

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

FURNACES, HEAT TREATING

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lee-Wilson Engineering Co.
20005 Lake Rd.
Cleveland 16, Ohio

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Illinois

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

FURNACES, HEATING

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
755 Prospect Avenue
Cleveland, Ohio

Lee-Wilson Engineering Co.
2005 Lake Rd.
Cleveland 16, Ohio

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

FURNACES, MELTING

Ajax Engineering Div.
Ajax-Magnethermic Corp.
P. O. Box 1418
Trenton 7, N. J.

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

GENERATORS, GAS ATMOSPHERE

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

GRINDERS, BELT

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDERS, DISC

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDER — POLISHER

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

LATHES, BUFFING & POLISHING

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

LEVELERS, ROLLER SHEET

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

LEVELERS—ROLLER & STRETCHER

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co.
Pittsburgh 22, Pennsylvania

Voss Engineering Co.
7301 Penn Ave.
Pittsburgh 8, Pa.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

MILLING MACHINES

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

MOLDS, INGOT

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

OVENS, AGEING

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio

The Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

OVENS, HEAT TREATING

Ajax-Magnethermic Corporation
3990 Simon Road
Youngstown 7, Ohio

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 Hubbard St.
Chicago 12, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

PISTON CORES

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

PLATING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

The Meaker Co.
1629 S. 55th Ave.
Chicago 50, Ill.

PRESSES, DRAWING, FORMING, STAMPING, ETC.

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, EXTRUSION

Birdsboro Corp.
Birdsboro, Pa.

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

PRESSES, FORGING

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N .Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, IMPACT EXTRUSION

F. Herlan Machinery Corp.
104 E. 40th Street
New York 16, N. Y.

E. W. Bliss Co.
1375 Raff Road S. W.
Canton, Ohio

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

PUMPS, MOLTEN METAL

Metal Pumping Services, Inc.
2727 Woodhill Road
Cleveland 4, Ohio

RACKS, ANODIZING

Servi-Sure Mfg. Co.
131 N. Green St.
Chicago 7, Illinois

RECTIFIERS—GERMANIUM & SELENIUM

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

REELS, PAY-OFF

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

ROLL FORMING EQUIPMENT

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

Arnold Metals & Machinery, Inc.
596 River Road
Clifton, New Jersey

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLS, ROLL FORMING

American Roller Die Corp.
29501 Clayton Ave.
Wickliffe, Ohio

Brunken & Goodwin Tool Engineering
7 North Second St.
Maywood, Ill.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLING MILLS

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Feller Engineering Co.
1159 Empire Building
Pittsburgh 22, Pa.

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co. Inc.
114 E. 32nd St.
New York 16, N. Y.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co.
Worcester, Mass.

Pittsburgh Engineering &
Machine Div.
Pittsburgh Steel Foundry Co.
Glassport, Pa.

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

ROLLING MILL AUXILIARY EQUIPMENT

The Aetna-Standard Div.
Frick Building
Pittsburgh 30, Pa.

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Feller Engineering Co.
1159 Empire Building
Pittsburgh 22, Pa.

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co.
Worcester, Mass.

Pittsburgh Engineering &
Machine Div.
Pittsburgh Steel Foundry Co.
Glassport, Pa.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co
Pittsburgh 22, Pa.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SAW BLADES, CIRCULAR

Heinemann Saw Corp.
Canton 6, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

North American Products Co.
P. O. Box 291M
Jasper, Ind.

Stone Machinery Co., Inc.
Manlius, N. Y.

SAWS, BAND

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

SAWS, CIRCULAR

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Stone Machinery Co., Inc.
Manlius, N. Y.

Wallace Supplies Manufacturing Co.
1808 W. Cornelia Ave.
Chicago 13, Ill.

SAWS, CUT-OFF

Loma Machine Mfg. Co.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Stone Machinery Co., Inc.
Manlius, N. Y.

Wallace Supplies Manufacturing Co.
1808 W. Cornelia Ave.
Chicago 13, Ill.

SAWS, MITRE

LeTarte Metal Specialties Co.
18105 E. Nine Mile Rd.
East Detroit, Mich.

Stone Machinery Co., Inc.
Manlius, N. Y.

SAWS, RADIAL ARM TYPE

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

SCALPERS, INGOT

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

SHEARING EQUIPMENT

E. W. Bliss Company
Salem, Ohio

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

United Engineering & Foundry Co.
Pittsburgh, Pennsylvania

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SHEET CASTING MACHINES, CONTINUOUS

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

SHELL MOLDING PATTERNS

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

SLITTING EQUIPMENT

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

The Yoder Company
5539 Walworth Avenue
Cleveland 2, Ohio

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SLUG CASTERS, EXTRUSION & FORGING

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

SPECTROGRAPHIC INSTRUMENTS

Baird-Atomic, Inc.
33 University Rd.
Cambridge 38, Mass.

STEAM CLEANING EQUIPMENT

Oakite Products, Inc.
50A Rector Street
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

STRAIGHTENERS AND CUTTING MACHINES, WIRE

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

STRAIGHTENERS, SHAPED STOCK

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

STRAIGHTENERS, TUBE AND BAR

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mackintosh-Hemphill Division
E. W. Bliss Company
901 Bingham Street
Pittsburgh 3, Pennsylvania

Mettler Machine Tool, Inc.
155 Adeline St.
New Haven, Conn.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

STRETCHERS, EXTRUSION

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

STRETCHERS, SHEET

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Ave.
New York 3, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

STRETCHERS, SHEET (CONT.)

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

STRIP-CASTING MACHINES, CONTINUOUS

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

SWAGING MACHINES, TUBE, BAR

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

THREAD ROLLERS

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

TRIMMING PRESSES FOR DIE CASTINGS

B & T Machinery Co.
Div. Greenlee Bros. & Co.
217 W. Eighth St.
Holland, Mich.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

TRUCKS, HAND

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

TUBE BENDING MACHINES

F. Herlan Machinery Corp.
104 E. 40th Street
New York 16, New York

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Wallace Supplies Manufacturing Co.
1808 W. Cornelia Ave.
Chicago 13, Ill.

TUBE DRAWBENCHES

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

The Yoder Co.
5539 Walworth Ave.
Cleveland 2, Ohio

TUBE MILLS

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

Feller Engineering Co.
1165 Empire Bldg.
Pittsburgh 22, Pa.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

TUBING ROLLS

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

TURNING MACHINES, CENTERLESS

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

ULTRASONIC CLEANING EQUIPMENT

Branson Ultrasonic Corp.
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Stamford, Conn.

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Vapor Blast Mfg. Co.
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General Dynamics Corp.
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Chicago 3, Ill.

WIRE DRAWING EQUIPMENT

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Morgan Construction Co.
Worcester, Mass.

X-RAY FILM PROCESSORS

Eastman Kodak Co.
X-Ray Div.
343 State St.
Rochester 4, N. Y.

SERVICES

ANODIZING SOURCE

Allmetal Weatherstrip Co.
1911 Ridge Ave.
Evanston, Ill.

Aluminum Finishing Corp.
1012 E. 21st Street
Indianapolis, Indiana

Aluminum Finishing of Fla.
145 65 N.W. 26th Ave.
Opa Locka, Fla.

American Anodizing Co., Inc.
1820 W. Lake St.
Chicago 12, Ill.

William L. Bonnell Co., Inc.
Newnan Ga.

City Plating & Polishing Div.
Cipco Corporation
22nd & Cole Streets
St. Louis 6, Mo.

Coil Anodizers Inc.
1250 Keating Ave.
Muskegon, Mich.

Colors, Inc.
5774 Massachusetts Ave.
Indianapolis, Ind.

Corson Industries
Delair, N. J.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Kawneer Company
Mill Products Div.
St. Charles, Ill.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Pyro Metal Finishers
10 Empire St.
Newark 12, N. J.

Southern Aluminum Finishing Co.
1581 Huber St., N.W.
Atlanta 18, Ga.

Southern Extrusions Co.
North Washington St.
Magnolia, Ark.

Superior Industries, Inc.
3786 Oakwood Ave.
Youngstown, Ohio

ANODIZING (HARD COAT)

Aluminum Finishing Corp.
1012 E. 21st Street
Indianapolis, Indiana

American Anodizing Co., Inc.
1820 W. Lake St.
Chicago 12, Ill.

Pyro Metal Finishers
10 Empire St.
Newark 12. N. J.

Sanford Aluminum Processing Co., Inc.
1330 W. Fulton St.
Chicago 7, Ill.

ANODIZING, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

BRAZING SOURCE

Lucas-Milhaupt Engineering Co.
5040 South Lake Drive
Cudahy, Wisconsin

FABRICATING ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Cipco Corporation
22nd & Cole Streets
St. Louis 6, Mo.

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kawneer Company
Mill Products Div.
St. Charles, Ill.

LaPointe Industries Inc.
Rockville, Conn.

North American Extrusions Corp.
5569 N. Riverview Drive
Kalamazoo, Mich.

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Rogers Industries, Inc.
14575 Meyers Road
Detroit 27, Mich.

Southern Extrusions Co.
North Washington St.
Magnolia, Ark.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

FABRICATING, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

FABRICATING, TITANIUM

Brooks & Perkns
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mch.

Harvey Aluminum
Torrance, Calif.

FINANCING SOURCE

James Talcott, Inc.
221 Fourth Avenue
New York, New York

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259 Wilkes Pl.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

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Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

PORCELAIN ENAMELING SOURCE

Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

SLITTING SOURCE

Fairmont Aluminum Co.
Fairmont, W. Va.

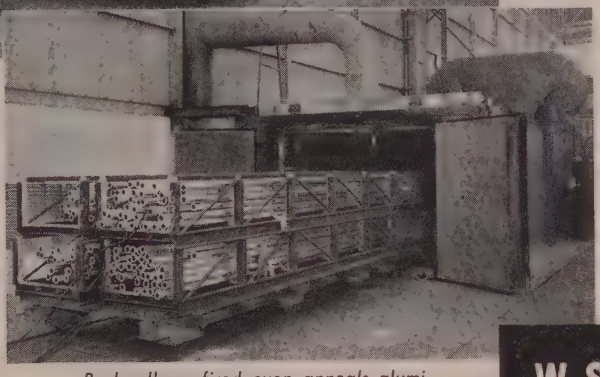
Metal Slitters, Inc.
113 Key Highway
Baltimore 30, Md.

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

from ingot to sheet, strip, foil, tubes, extrusions, stampings

Large Rockwell furnace homogenizes this 100,000-lb. load of aluminum alloy extrusion ingots.



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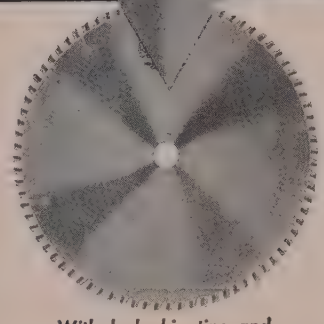

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The insertion of copper discs at the base of each expansion slot under high pressure on the Gold Dot Saw has solved many problems which have plagued the users of carbide saws.

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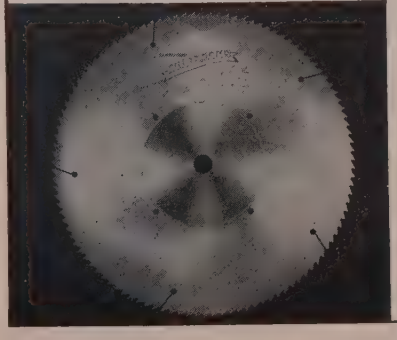

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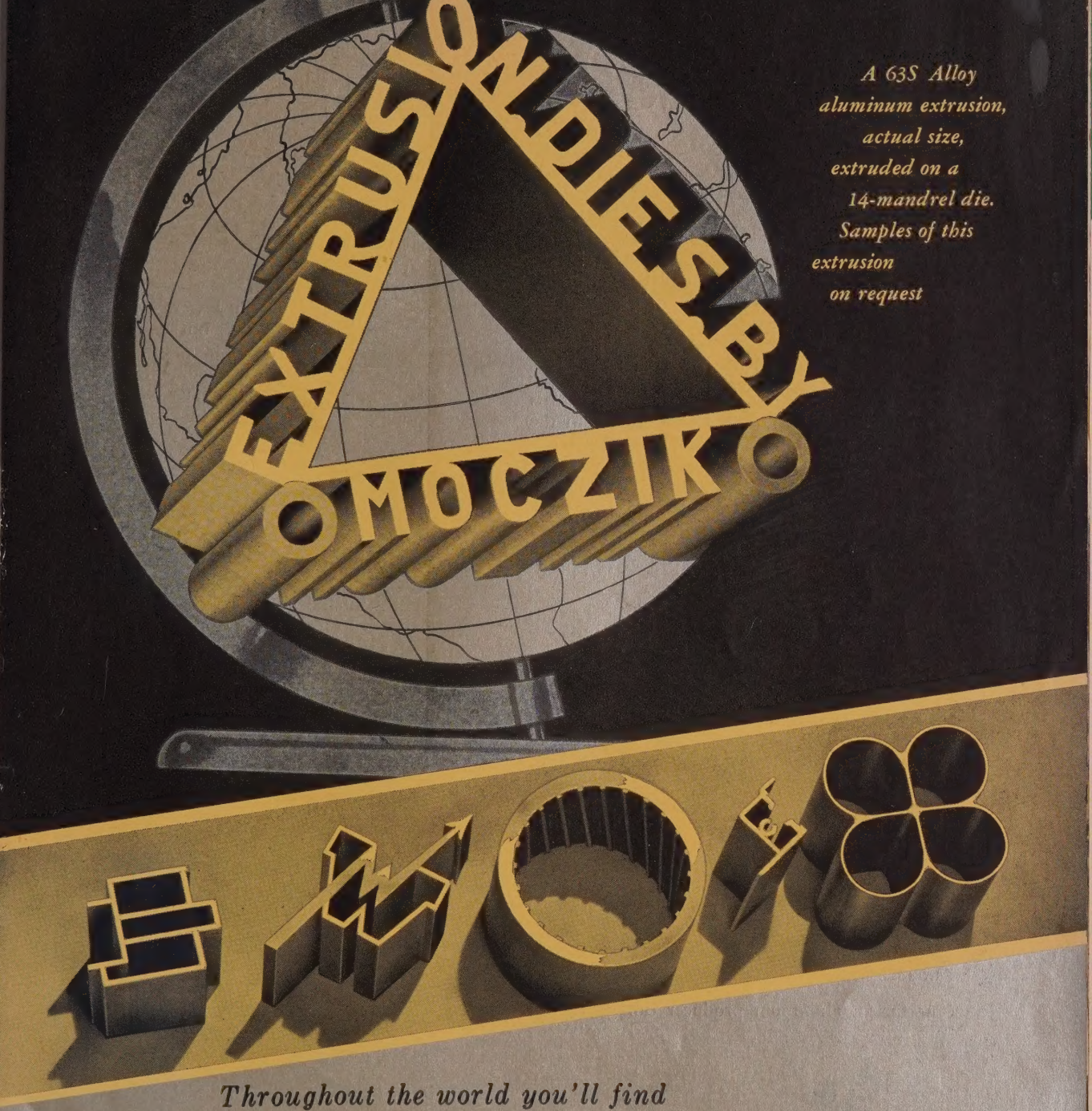

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Looking Ahead

High rate of aluminum production (around 85% of capacity), plus the recent opening of Alcoa's new Warrick, Ind. smelter, are in sharp contrast to steel operations—currently limping along at about 62% of capacity. Some steel men think production may drop to as low as 50-52% of capacity, but U.S. Steel president Roger Blough expects it to bottom out at no lower than 57%. Blough thinks orders will turn up in August; believes current steel consumption would support production at 70-75% of capacity.

Steel makers are waking up to competitive threats posed by aluminum. One of the biggest in the stainless steel game is said to have earmarked a million dollars for promoting the ferrous stuff in competition with aluminum in building. And U.S. steel, apparently worried by talk of aluminum cans, is working on tinplate that is "lighter, thinner and stronger than anything now used in can making." There's even talk of going after one of aluminum's markets—baking pans and frozen food trays—though this sounds far-fetched.

When the Justice Department queered the deal that would have made Apex Smelting a division of Aluminium Limited, it looked like the tipoff on a tougher government policy toward acquisition of fabricators by the aluminum producers. Last December the big Canadian producer said it would buy the assets of Apex, the biggest secondary aluminum smelter. Since the Justice Department cannot dictate to the Canadian company, the red light must have been flashed at Apex. While this deal looks dead, chances are some smelters will sell out to other primary producers—if they get around the government's notion that further integration isn't a normal way of life.

Just how far an aluminum producer can go in this direction may soon be known. After Alcoa bought Rome Cable last year, Justice filed an injunction to block the move. Alcoa fought back, and early this month a federal judge denied the government's motion for a preliminary injunction. But until the case has been decided, Alcoa cannot pledge Rome Cable stock, nor can it transfer manufacturing operations from Rome to Alcoa plants. This may be a test case; should be resolved soon.

Nonferrous foundry business, often a barometer of heavy industry activity, has dipped each month this year. This, plus mounting supplies of aluminum scrap, has caused a weak ingot market. Result: Smelters shaved 1 to 1½ cents off the price of big tonnage alloy ingot early this month. While published prices range from 24 to 22½ cents a pound, some foundries are buying at below the new price. This contrasts with the 26-cent tag on primary ingot—which is also being shaded for certain types of castings.

With automakers casting more of their own parts, the woes of independent foundries (and die casters) multiply. But some say the casting firms have no one to blame but themselves. At the foundry meeting last month, they were told that they had failed to keep pace with population trends and industrial growth. In the last ten years, population grew 20%; the foundry business only 3%. They were also told that they make good castings but don't know how to sell them. Result: Many parts have been switched to stampings, weldments, etc. What's needed, said Bill Grede, former NAM president, is more research and more promotion telling what castings can do; where they can be used.

Extrusion business has deteriorated even more since the latest Yates Committee hearings (see page 32). This, of course, means that price cutting is once more rampant—and everybody is blaming the other guy, as usual. Kaiser Aluminum apparently decided to pull in its horns; this month shut down eight of the 15 presses at its Halethorpe plant. Heavy presses will continue to operate, but the move looks permanent for smaller presses. The company is helping released workers get new jobs. The cutback has not affected Kaiser's Dolton (Ill.) plant, although some shapes will be shipped from Halethorpe to supplement Dolton's output. The Extruders Council is meeting this month in Chicago. We'll be on hand to sample their business outlook for a report in July.

Titanium outlook is brighter than expected, but far from rosy. Nearly 2 million pounds of mill products were produced in the first quarter—16% better than the amount in January-March 1959. The Commerce Department had forecast a 19% drop in mill product output for the year; apparently figured that phase-out of the B-52 bomber program would trim demand. Some titanium men don't expect the first quarter showing to hold up through the year. Others disagree; point to bullish factors such as possibility of a round-the-clock airborne alert, which would boost demand for spare engines and airframes that use titanium. Use of titanium in the Davy Crockett atomic bazooka also raises hopes. This remarkable new artillery piece may use 2 million pounds of titanium in the next five years. Meanwhile, missile makers continue to boost their titanium needs, and titanium firms keep courting civilian markets. But even if first quarter output holds up for the rest of the year, titanium mill product volume will fall far short of the record 11.3 million pounds turned out in 1957. Sales totaled $100 million in those lush days; will have to go some to hit $60 million in '60.

—The Editors

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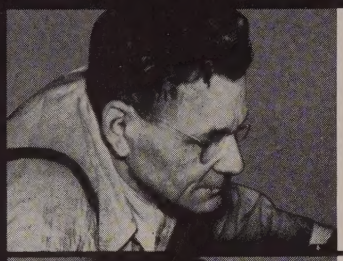

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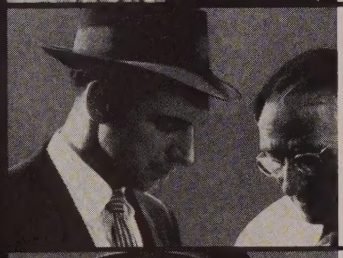

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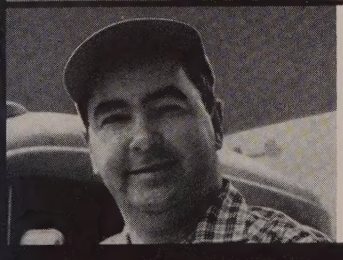

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